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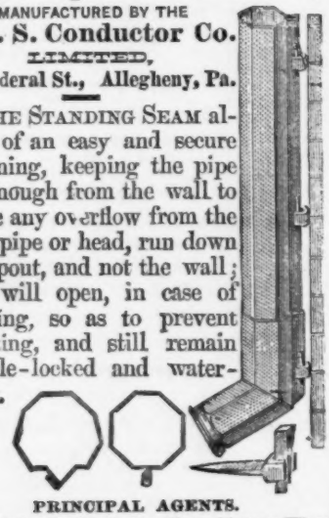

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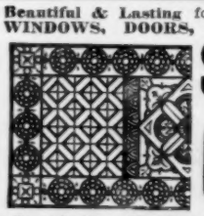

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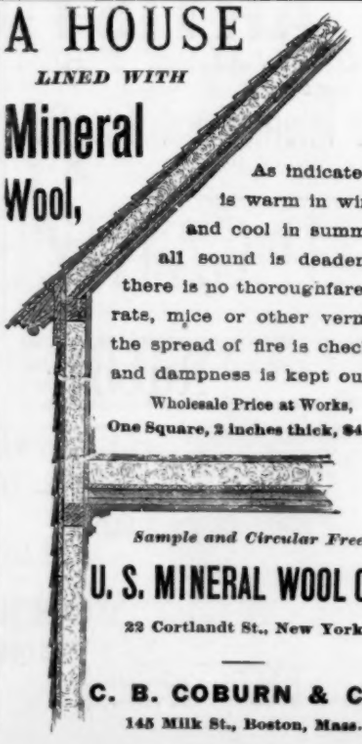

As indicated, is warm in winter and cool in summer; all sound is deadened; there is no thoroughfare for rats, mice or other vermin; the spread of fire is checked and dampness is kept out.

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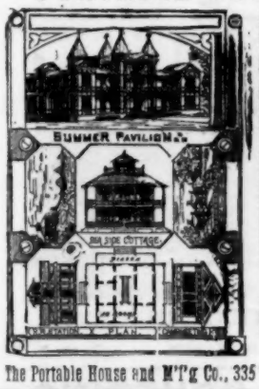

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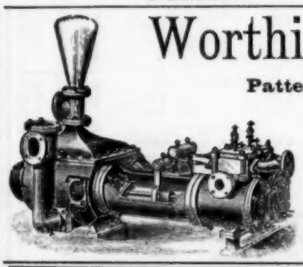

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Cash Capital	**$1,000,000.00**
Reserve for Re-insurance	**635,741.16**
Reserve for all other Liabilities,	**96,655.57**
Net Surplus	**832,744.56**
Total Assets, January 1, 1883	**2,565,141.29**

BUILDING MATERIALS.

Reported for the American Architect and Building News.

BRICK.—₱ M.	New York. (*Wholesale Prices.*)	Boston. (*Prices to Builders and Contractors.*)	Chicago. (*Prices to Builders and Contractors.*)	Philadelphia. (*Prices to Builders and Contractors.*)
Common: *Cargo afloat.*				
Pale	$2 50 @ $3 50	Eastern 7 50 @ 8 00	Building Brick 8 00 @ 8 50	Hard 7 50 @ 8 50
Jersey	4 25 @ 4 75	Bay State Hard 9 00		Salmon 5 00 @ 6 00
Up River	5 00 @ 5 50	Domestic Com. 8 00 @ 9 00	Indiana Pressed 16 00 @ 28 00	Stretchers 11 00 @ 12 50
Haverstraw Bay	5 50 @ 6 00	Domestic Face 15 00 @ 20 00	St. Louis Fronts 25 00 @ 30 00	Pressed 20 00 @ 23 00
" 1st	6 00 @ 6 50	Philadelphia 40 00 @ 45 00		
Fronts:		Phila. mould 50 00 @ 80 00		
Croton, Brown	13 @ 14 00		22 00 @ 35 00	
" dark	14 @ 15 00		65 00 @ 350 00	
" red	14 @ 15 00		@ 55 00	
Chicago pressed				
Chicago Moulded				
Baltimore	37 @ 41 00			
Glens Falls — white	30 @ 35 00	Glens Falls 25 00 @ 26 00	42 00 @	
Philadelphia	@ 27 00		40 00 @	
Trenton	@ 27 00		25 00 @	
Milwaukee		Glens Falls Mould.	60 00 @ 100 00	
Moulded:				
Clark's Glens Falls — Red	25 00 @ 27 00	30 00 @ 35 00	30 @	
" — White	30 00 @ 35 00	35 00 @ 40 00	35 @	
White " Mold,	45 00 @ 60 00	45 00 @ 60 00	55 00 @ 65 00	
Enamelled: *Imp.*				
Enamelled (edge.)	85 00 @ 100 00	@	@ 100 00	Dom. @ 65
Enamelled (edge and end)	90 00 @ 115 00	@	@ 120 00	@ 85
CEMENT, LIME, etc.—(₱ *cask.*)				
Rosendale Cement	80 @ 1 00	@ 1 50	*Not Sold.*	1 50 @ 1 75
Utica, Akron, Buffalo, Louisville, Milwaukee	*Not sold.*	*Not sold.*	1 00 @ 1 25	*Not sold.*
Portland (English)	2 60 @ 3 10	@ 3 20	3 00 @ 3 25	3 25 @ 3 50
" (Saylor's Am.)	2 05 @ 2 40	2 50 @ 3 00	2 75 @ 3 00	2 50 @ 3 00
" (Dyckerhoff)	2 75 @ 3 15	3 00 @ 3 50	3 25 @ 3 75	3 00 @ 3 25
" (Lafarge)	3 50 @ 4 50	*Not sold.*	3 75 @ 4 25	4 50 @
" (Star)	2 70 @ 3 00	*Not sold.*	*Not sold.*	*Not sold.*
K. B. & S. (Eng.) Portland	2 85 @ 3 10		3 35 @ 3 50	3 00 @ 3 25
Burham " "	2 60 @ 2 80		3 15 @ 3 35	2 75 @ 3 00
Vorwohler	2 65 @ 3 25		3 00 @ 3 25	
German (Fewer)	2 50 @ 2 70	3 15 @ 3 35	3 15 @ 3 35	
" (Alsen)	2 50 @ 2 60	3 00 @ 3 50	3 15 @ 3 35	2 90 @ 3 25
Scientific		1 65	*Not sold.*	
Hydraulic Lime of Teil	@ 5 00		*Not sold.*	
Roman	2 75 @ 3 00	@ 3 20	2 75 @ 3 25	3 50 @ 3 75
Keene's coarse	5 00 @ 6 00	@ 7 50	8 00 @ 9 00	6 50 @ 7 00
" fine	9 25 @ 10 25	@ 11 50	12 00 @ 13 00	11 50 @ 12 00
Lime:				
Chicago Lime in bulk			65 @ 75	White Mash 1 25 @ 150
Wisconsin "			80 @ 90	1 00 @ 1 00
Rockland and Rockport, (Com.)	@ 1 00	@ 1 10	*Not sold.*	
Rockland and Rockport, finish	@ 1 20	@ 1 15	*Not sold.*	
State, com. cargo rates (nom.)	75 @ 80	*Not sold.*	*Not sold.*	*Not sold.*
State, finishing "	95 @ 1 10	*Not sold.*	*Not sold.*	*Not sold.*
Plaster of Paris (calcined)	1 30 @ 1 35	1 70 @ 1 90	@ 1 75	2 00 @ 2 25
" (casting)	1 50 @ 1 65	@ 2 25	@ 2 00	2 25 @ 2 50
Hair (Cattle) ₱ *bush*	21 @ 23	@ 30	30 @ 35	20 @ 25
" (Goat)	30 @ 35	@ 30	35 @ 40	28 @ 33
Sand, ₱ *load*	1 00 @ 1 25	@ 1 50	100 @ 1 25	@ 1 50
STONE. (₱ *cubic foot, rough.*)				
Granite: (*Maine*)		@ 60		75 @ 2 00
Limestone:				
Bedford	@ 1 00	95 @ 1 00	50 @	3 75 @
Joliet	@		35 @ 55	
Lemont	@		35 @ 60	
Serpentine	@		80 @ 90	75 @ 1 25

(*Continued on page vi.*

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Foundation:				
Dimension	@	5 00 ℔ ton	20 @ 28	30 @ 5 00
Block	@	4 60 ℔ perch	8 50 ℔ cord.	50 @ 6 00
Rubble	@	1 25 @ 1 50	8 50 @	
Bluestone: (℔ *sq. ft.*)				
Sidewalk	30 @ 5 00	40 @ 1 75	75 @ 1 00	70 @ 90
Planed	50 @ 6 00	75	50 @ 1 00	1 10 @ 1 25
Sandstone.				
Longmeadow		75 @ 85		
Brown (Connecticut)	1 00 @	1 25 @ 1 45	1 50 ℔ cub.ft.	1 35 @ 2 00
Amherst	1 00 @	90 @ 1 00	55 @ 65	
Berea	75 @ @ 1 00	80 @ 90	45 @ 55	90 @ 1 10
Berlin	75 @ @ 1 00	80 @ 90	55 @ 65	
Bay of Fundy	@ @ 1 00	*Not sold*	*Not sold.*	
Belleville	80 @ @ 1 25	1 25 @ 1 35	"	
New Brunswick	@ @ 1 00	90 @ 1 00	"	
Caen	@ @	@ 2 00	"	
Marble (℔ *cu. ft.*)				
Lee, Mass.	@ @	1 75 @ 2 50	*Not sold.*	2 00 @ 2 50
Rutland, white	@ @	@ 3 00	3 50 @ 5 00	2 25 @ 2 50
Sutherland Falls	1 25 @ 1 75	@ 2 00	3 50 @ 5 00	2 50 @ 4 00
Glens Falls, black	@ @	2 00 @ 3 00	*Not sold.*	4 00 @ 4 50
Italian, blue-veined	@ @	50 @ 60	@ 4 40	—— @ ——
" Sienna	@ @	3 00 @ 3 50	*Not sold.*	3 25 @ 6 50
Tennessee, red	@ @	1 25 @ 2 50	@ 4 00	2 00 @ 3 00
" Knoxville	@ @	85 @ 90	@ 4 00	@ 1 50
Pennsylvania, blue	@ @		*Not sold.*	2 23 @ 2 50
Vermont, white	@ @	1 50 @ 2 00	3 50 @ 5 00	
Slate: Roofing (℔ *square*)	7 00 @ 8 00	4 50 @ 7 00	6 25 @ 8 10	6 25 @ 7 00
" green	7 00 @ @ 8 50	5 50 @ 6 50	@ 8 60	@ 7 00
" purple	@ @ 15 00	13 00 @ 14 00	—— @ 16 00	@ 12 00
" red	—— @ ——	Brownville, Me.	7 20 @ 7 60	@ 4 50
" black, Lehigh	—— @ ——	6 50 @ 9 00	7 30 @ 8 00	@ 4 25
" " Chapmans	@	Monson, Me.	*Not sold.*	@ 15 00
Tiles, Am. ℔ M.		5 50 @ 8 00		
LUMBER.—℔ M. (*Ordinary dimensions.*)				
Boards:				
Pine, 1st quality, clear	65 00 @ 75 00	50 00 @ 53 00	44 00 @ 49 00	50 00 @ 52 00
" 2d quality	55 00 @ 60 00	42 00 @ 44 00	40 00 @ 46 00	42 00 @ 47 50
" 3d quality	18 00 @ 22 00	35 00 @ 38 00	37 00 @ 44 00	22 00 @ 25 00
Spruce	25 00 @ 25 00	11 00 @ 12 50	*Not sold.*	
Hemlock	ea. 17 @ 18	11 00 @ 12 50	@ 10 00	11 50 @ 15 00
Yellow pine	20 @ 40	30 00 @ 33 00	@ 28 00	16 00 @ 18 50
Cypress	@	32 00 @ 35 00	@	@
Clapboards:				
Pine	@	33 00 @ 55 00	14 00 @ 22 00	—— @ ——
Spruce	@	23 00 @ 30 00	*Not sold.*	—— @ ——
Framing Timber:				
Pine			13 00 @ 15 50	25 00 @ 35 00
Spruce	14 00 @ 18 00	13 50 @ 14 50	*Not sold.*	18 50 @ 20 00
Hemlock	12 00 @ 15 00	@	13 00 @ 19 00	12 00 @ 13 00
Yellow pine	20 00 @ 30 00	21 00 @ 25 00		18 00 @ 22 00
Laths:				
Pine	@	2 25 @ 2 35	2 25 @	—— @ ——
Spruce	2 35 @ 2 50	2 15 @ 2 25	*Not sold.*	2 35 @ 2 40
Shingles:			*Not sold.*	
Pine, shaved ℔ M.	5 00 @ 6 00	@	2 25 @ 2 60	
Pine, sawed "	4 00 @ 5 00	@ 4 50	*Not sold.*	
Spruce, sawed "	2 50 @ 2 75	@ 1 50	*Not sold.*	
Redwood ℔ 125.	1 40 @ 1 60	3 75 @ 4 50	5 50 @ 8 00	30" $10 @ 28
Cedar, split ℔ M.	@	@	*Not sold.*	24" 8 @ 21
Cedar, sawed "	@	2 00 @ 3 50	@ 2 30	20" 5 50 @ 14
Cypress. Split....7 x 24. "	18 00 @ 20 00	5 50 @ 6 00	4 00 @ 4 50	13 00 @ 20 00
Miscellaneous:			*Not sold.*	
Piles ℔ ft.	4½ @ 6	Piles 6c. ℔ ft.	Pine, 8 @ £2	12 00 @ 14 00
Fence pickets, Spruce	8 00 @ 10 00	10 00 @ 18 00	9 00 @ 21 00	70 @ 1 25
Cedar posts, 9 ft. (sq. posts.)	@	25 @ 35	*Not sold.*	28 @ 36
Chestnut "	@	25 @ 35		
Finishing Woods: ℔ M. (*First Quality, Kiln-dried.*)				
Ash	@ 55 00	38 00 @ 48 00	35 00 @ 40 00	
Cherry	80 00 @ 120 00	60 00 @ 90 00	75 00 @ 85 00	55 00 @ 65 00
Chestnut	@ 55 00	38 00 @ 50 00	45 00 @ 50 00	60 00 @ 80 00
Butternut	40 00 @ 60 00	60 00 @ 70 00	50 00 @ 60 00	55 00 @ 65 00
Mahogany, Baywood	@ 180 00	100 00 @ 150 00	150 00 @ 180 00	100 00 @
" St. Domingo	@ 350 00	180 00 @ 250 00	250 00 @ 300 00	
Maple	45 00 @ 50 00	45 00 @ 65 00	30 00 @ 35 00	30 00 @ 50 00
Oak, red	@ 70 00	@ 50 00	35 00 @ 40 00	35 00 @ 45 00
" white	@ 70 00	@ 55 00	35 00 @ 40 00	55 00 @ 65 00
" quartered	@ 90 00	65 00 @ 70 00	45 00 @ 50 00	70 00 @ 80 00
Sycamore quartered		@ 65 00	45 00 @ 50 00	
Pine, clear	65 00 @ 70 00	30 00 @ 65 00	45 00 @ 50 00	65 00 @ 90 00
Redwood	60 00 @ 70 00	60 00 @ 70 00	60 00 @ 70 00	100 00 @
Rosewood ℔ lb	@ 6		@ 7	
Walnut, black	125 00 @ 150 00	85 00 @ 100 00	80 00 @ 100 00	160 00 @ 200 00
Whitewood	45 00 @ 50 00	38 00 @ 45 00	30 00 @ 35 00	20 00 @ 30 00
Yellow pine ℔ M.	@ 45 00	40 00 @ 45 00	30 00 @ 35 00	30 00 @ 35 00
Gumwood, best red			30 00 @ 35 00	
PAINTS. (*In oil,* ℔ *lb.*)				
White lead, Am.	5½ @ 6	5½ @ 6	5½ @ 5¾	4 @ 5½
" Zinc, "	5 @ 8½	5 @ 8	7 @ 11	4 @ 6
Red, Am.,	6 @ 6½	6 @ 6½	5½ @ 6	
" Venetian	6 @ 10½	7 @ 12	1½ @ 2½	7 ℔ 10
" Vermilion	65 @ 70	65 @ 70 dry	50 @ 60	Am. 14 @ 22
Red Indian, Eng.	12 @ 20	12 @ 20	12 @ 20	12 @ 20
Yellow Ochre	6 @ 15	7 @ 12	3 @ 15	7 @ 9
" Chrome	12 @ 20	18 @ 25	12 @ 25	12 @ 25
Green (chrome)	8 @ 13	8 @ 20	8 @ 20	9 @ 15
Green, Paris,	25 @ 40	25 @ 40	16 @ 35	16 @ 22
Black, lamp,	15 @ 28	15 @ 25	8 @ 30	8 @ 12
Blue, ultramarine	12 @ 18	18 @ 30	10 @ 35	11 @ 35
Oil, linseed, (raw) ℔ gal.	53 @ 54	53 @ 58	48 @ 49	52 @ 55
" " boiled	56 @ 57	56 @ 61	51 @ 53	57 @ 58
Turpentine	33½ @ 34	36 @ 43	32 @ 34	@ 45
Varnish, coach		1 50 @ 6 00	1 25 @ 2 00	1 75 @ 5 25
Shellac		2 50 @ 3 00	3 25 @ 4 00	1 10 @ 1 75
Putty	2 @ 3	2 @ 4	02 @ 03	2 @ 2½
Whiting ℔ cwt.	50 @ 90	1 @ 1½	1 @ 2	1 @ 1½
Paris white, (Eng.,)	2 @ 3	2 @ 3	2 @ 2½	1½ @ 1½
Litharge, Am.	5½ @ 5½	6½ @ 7	6½ @ 10	6½ @ 7½
Sienna, (burnt)	12 @ 17½	14 @ 20	4 @ 16	9 @ 14
Umber, "	11 @ 16½	14 @ 20	@ 10	9 @ 14

(Continued on page vii.)

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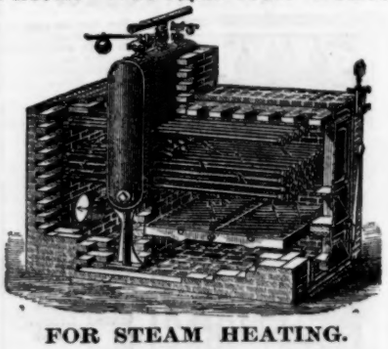

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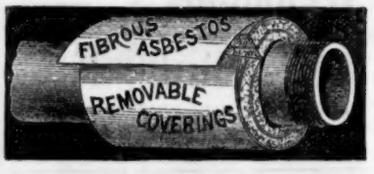

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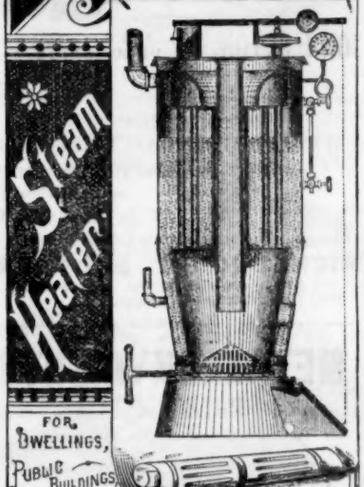

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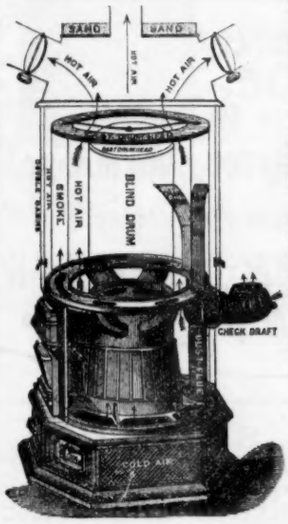

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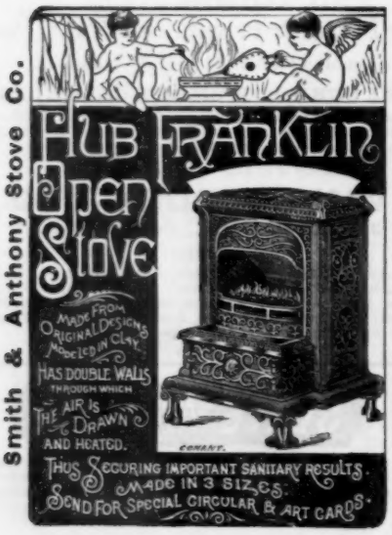
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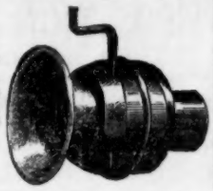

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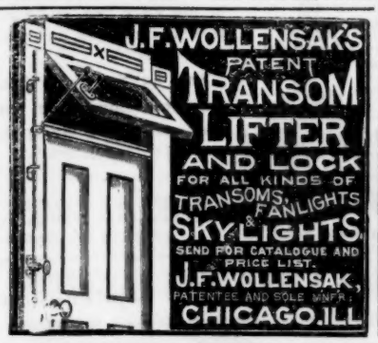

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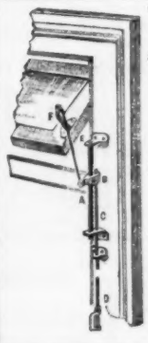

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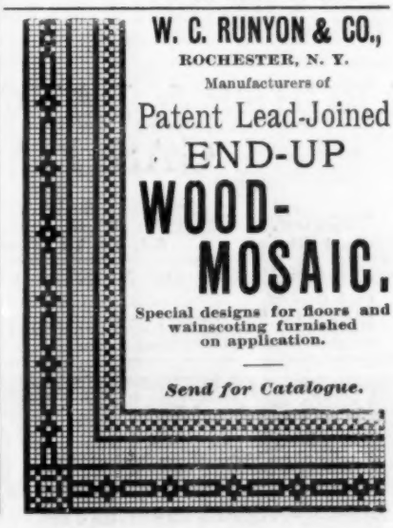

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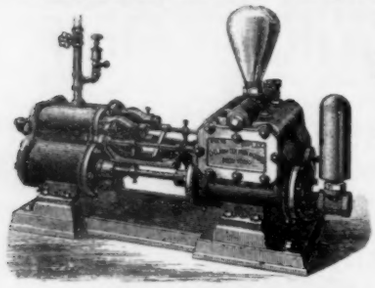

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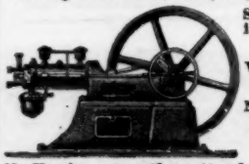

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XVI. Copyright, 1884, JAMES R. OSGOOD & Co., Boston, Mass. No. 467.

DECEMBER 6, 1884.

Entered at the Post-Office at Boston as second-class matter.

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THE pedestal for the great statue of Liberty is in process of slow construction, and eight courses of granite have been laid above the foundation, bringing the pedestal to a height of something more than sixteen feet. On account of the approach of winter, work on the ground has been discontinued; but quarrying will still go on, and materials will be accumulated for active operations in the spring. Money is still lacking for the completion of the pedestal, and about one hundred and forty-eight thousand dollars will be needed to pay for the work required to fit it for the reception of the statue, but this seems a small sum, compared with the total cost as first estimated, and it is much to be hoped that it may be easily secured. The French Government has detailed a war vessel to receive the statue and transport it, some time next May, to New York, and if contributions come in freely, the pedestal may still be ready for the reception of the statue on its arrival. The setting of the figure in position, with the interior bracing, will occupy two or three months more, but it is hoped that everything may be in readiness for a public inauguration early in September.

THE consequence of the extension of the copper-mining industry in this country, and the consequent extinction of the monopoly under which the managers of the Lake Superior mines for many years fixed the price of the metal to suit themselves, has been a reduction in the price. One would suppose that the owners of the mines, seeing the value of their product so diminished, would combine to reduce their output, but the contrary has been the case, and the Chilian and Spanish mines, as well as those of the United States, are increasing their production every day, curtailing their expenses at the same time, in order to gain a little profit even from sales at a low price. The danger which now confronts them is, however, that the limit of demand for the metal will be reached, and that they will be unable to sell their copper at any price. Considering the small number of purposes for which copper is now used, this does not seem a very remote contingency. The American output is now about one-half that of the whole world, and if the world is now supplied with all the brass goods, copper kettles, cartridge cases, and telegraph wires that it can consume, it will be useless to furnish more of these, even at a somewhat cheaper rate than before. The real hope of the copper miners is in the substitution of copper for iron for certain purposes. More than a hundred pounds of iron are now used in the world for every pound of copper; and if one per cent of the iron at present consumed could be replaced by copper, the entire production of the copper mines now existing, together with as many more just like them, would be absorbed. We think it is not too much to say that with intelligent effort on the part of manufacturers this substitution, or something approaching it, could be effected, much to the advantage of every one except, perhaps, the iron-workers. To take a single instance, there is hardly any use to which Russia sheet-iron is now put that could not be better fulfilled by copper, and in the end copper, at ten or eleven cents a pound, would probably be cheaper than the iron at five or six. We have seen stove-pipes made of copper, which are not only very handsome in appearance, but must be as strong as those of iron, as well as less likely to crack at the seams, while they are practically indestructible by rust. For the exterior casings of stoves and furnaces, also, it seems as if copper might be extensively used, as, indeed, it already is in some degree for gas-stoves, while boilers, which are now sometimes made of it in small sizes, might perhaps be economically cased or tubed with it in the larger sizes. Every one does not know that water, owing to the high conducting power of copper, boils more readily in a copper vessel than in one of iron; and it is not unusual for plumbers, in cases where house ranges fail to supply hot water enough, to take out the cast iron water-fronts, and substitute new ones of brass or copper, by means of which a larger quantity of water can be heated in a given time. The general application of copper to roofing purposes, which is strongly advocated, seems to us, although desirable, not very likely to occur. To say nothing of the first cost of such a covering, even at present prices, the practice of roofing with sheet-metal of any kind is rather diminishing, on account of the perfection with which roofs of asphalt or composition are now applied, and copper for such purposes must compete, not with tin or lead, but with tarred felt, worth three or four cents a square foot, instead of fifteen or twenty. To these possible outlets for the supply of copper might, if the copper manufacturers could take advantage of the cheap processes for the production of aluminium of which we hear so much at the present time, be added another, in the shape of the manufacture of household articles of the beautiful and unchangeable aluminium bronze. With the addition of five or six per cent of aluminium, copper is converted into the best material yet discovered for making house hardware, gas-fixtures, lamps, and other objects of the kind. The price of such things generally bears very little relation to the weight, and a new kind of brasswork, which would never tarnish or need polishing, would not fail to be appreciated in every family.

THE New York *Times* gives an account, which, if true, is of great importance, of a new process for producing metallic aluminium, which is likely to reduce the cost of the product very materially. The process is due to a Philadelphia chemist, a pupil of Wöhler, and has been partially described before. It consists substantially in the substitution for the metallic sodium employed in the old process, of sodium vapor, formed by heating carbonate of soda in a retort with carbon or some other reducing agent, and as carbonate of soda costs about one cent a pound, instead of three dollars, which is the price of metallic sodium, the expense of the process is much diminished, and a better quality of aluminium can be obtained at a dollar and a quarter a pound than the old method produced at fifteen dollars. The process is no longer an experiment. Many thousands of ounces of metal have been produced and sold, and a collection of raw material and manufactured articles has been sent to the New Orleans Cotton Exhibition. Although a dollar and a quarter a pound seems a high price for any but the precious metals, it must be remembered that aluminium weighs only about one-fourth as much as lead, iron, or silver, and that, for instance, a metallic plate of a given size and thickness, which would be worth in copper ten cents, would cost only about thirty-five cents in aluminium; and as the latter metal does not tarnish in air, or even in sulphuretted hydrogen, and is not affected by nitric or sulphuric acid, it has a value for many purposes superior to that of any metal except silver or gold. Notwithstanding its great cost at present, its lightness renders it particularly valuable in certain applications. Drawing instruments, for example, are sometimes made with it, in place of brass or German silver, and it is said that soldiers' buttons and buckles are made of a composition of aluminium and copper, which are so much lighter than the ordinary brass that the men whose clothes are supplied with them can carry thirty or forty more cartridges than before.

THE last of the great Alpine tunnels, that of the Arlberg, has been completed with so much less trouble than the two which preceded it, that comparatively few persons, probably, knew that it was in progress before the announcement of its inauguration, which took place last September, in the presence of the Emperor of Austria. The Arlberg tunnel is much the most easterly of the three roads under the Alps, the Mont-Cenis being the most western, and the Saint-Gothard nearly midway between. The original occasion of its construction was rather military and political than commercial. Two

of the provinces of Austria, the Vorarlberg and the Tyrol, had, until the tunnel was built, no means of communication with each other except over the pass of the Arlberg mountain, or, if rapid and convenient transit was desired, by means of the Bavarian railways, which connected from the north with both provinces. There was serious danger that in case of war, with perhaps the blockading of the Bavarian roads, the Vorarlberg might be cut off from the rest of the Austrian territory, and it was finally decided to begin the tunnel at the public expense; but as the line through it will make a saving in distance over the old routes between Paris and Belgrade, Trieste, Salonica and Constantinople, of sixty to nearly two hundred miles, it is likely to be a profitable enterprise in the end.

THE length of the tunnel is something over six miles, the grade rising from each end to a summit under the middle of the mountain. The formation traversed was mostly hard rock, passing from gneiss to mica-schist. The method of tunneling, like that used in the Mont-Cenis, was that known as the English plan, a pioneer excavation being driven some distance in advance of the main tunnel, and in line with the base of the finished work. As fast as the pioneer tunnel was carried forward, permanent gutters were formed in the bottom, to carry off water that might collect in the excavation, and pipes were laid for conveying air to the drilling-machines and for ventilation. In the Belgian method, which was employed at the Saint-Gothard, the pioneer tunnel was driven at the upper part of the intended excavation, but the advantage of being able to establish at once permanent waterways and air-supply pipes seems to give the other a decided superiority. At the Arlberg, moreover, short shafts were carried up at intervals of eighty to two hundred feet, which, when the main excavation was carried out, came in the floor of the upper drift, which was excavated a little in the rear of the pioneer tunnel, and were found very useful for dropping material excavated from above into cars, which were immediately brought in on temporary rails laid on the bottom of the pioneer tunnel. Power for driving the drills was obtained from the mountain torrents; one, the Rosanna brook, at the Tyrolese end, giving a force of fifteen hundred horses during the summer, and of about half that in winter, when the channel was choked with ice. At the other end, by collecting five small rivulets, a force of five hundred horses was obtained. The Rosanna power was utilized by turbines, but the other was applied directly through pipes to hydraulic drills, in which the drill was held firmly against the rock by a piston moving in a cylinder filled with water under pressure, and was at the same time turned by endless screws at the rate of five to twelve turns a minute. In soft rock this instrument would advance at the rate of three or four inches a minute, but the average was much less than that, and the blades of the drill, which were movable, required changing every few feet. The drills at the eastern end were operated by compressed air, and acted by percussion upon the rock, as in the case of the common hand-drills. The character of the rock at the two ends being quite different, it was impossible to compare fairly the work done by each form of drill; but both seem to have done excellent service, and the entire tunnel was completed and opened for service in less than four years from the time the mountain was first attacked.

WE are glad to find that there are other people in the world, besides the editors of the *Scientific American* and ourselves, who find it hard to believe in the Keely Motor. The last number of the *Schweizerische Bauzeitung*, in speaking of the so-called "tests" of the etheric cannon at Sandy Hook, remarks, rather disrespectfully, that the celebrated motor is obviously "nothing but an ordinary American humbug." This opinion is shared, according to the New York *Times*, by Lieutenant Zalinski, of the United States army, who was deputed by Colonel Hamilton to accept in his place a pressing invitation to inspect the motor in the inventor's workshop in Philadelphia. The Lieutenant, having been accepted by the Keely directors as a substitute for Colonel Hamilton, proceeded to Philadelphia, armed with a ten-thousand-pound pressure gauge, which seemed, from the accounts, to be the only ordinary scientific instrument applicable to the interatomic force. On reaching the laboratory, he found a "reservoir" filled with interatomic force, in readiness to be connected with an engine. Recurring to the claim that the mysterious force could be produced in a few seconds, by blowing into tubes, tapping boxes with "vibrators," and so on, the visitor suggested that he would like to see the operation of manufacturing the ether, and would be pleased if the pent-up force could be allowed to escape, and the reservoir recharged in his presence. The great inventor objected to this, on the ground that the reservoir had been carefully "negatized," and it would take two hours to refill it. The request was not pressed, and the incantations, or whatever they may be called, proceeded. By-and-by Mr. Keely announced that he had got fifty thousand pounds pressure to the square inch, but immediately remarked that he had broken all his pressure gauges. Lieutenant Zalinski then bethought himself of his standard gauge, and mentioning that he had one with him which registered up to ten thousand pounds, said that he would be glad to have it applied and broken. No reply was made to this offer for a time, but at length the great inventor remarked that "he didn't believe in pressure gauges, anyhow." Unfortunately, the experiments failed of tangible result, on account, as Lieutenant Zalinski was informed, of "an accidental break in a pipe," so that he was obliged to return without witnessing any convincing exhibition of "interatomic force."

A CURIOUS chemical process has just been introduced on a commercial scale in France by the brothers Brin, who, finding that there is a demand for pure oxygen gas, for medical and other purposes, have constructed machinery for separating the gas from air by the agency of caustic baryta, a substance somewhat resembling lime. The caustic baryta has, however, the property, which lime does not seem to possess, of absorbing a certain portion of oxygen in addition to that which it already contains, and of yielding up again this absorbed oxygen when heated and placed in a vacuum. The process for utilizing this property is a simple one. A certain quantity of baryta is placed in each of a series of iron retorts, which are heated, and air, freed from any trace of carbonic acid by passing through lime-water, then forced in. The compressed air, brought in contact with the heated baryta, gives up its oxygen, and the nitrogen is allowed to escape. After the peroxidation is complete, the retorts are heated more strongly than before, and are disconnected from the condensing-pump, and attached to an air-pump of the ordinary sort. This exhausts the nitrogen remaining in the retorts, and oxygen is then evolved from the baryta, and continues to escape until all that previously absorbed has been given off. Nothing more is then necessary than to put the oxygen into shape for sale, which is done by forcing it, under considerable pressure, into bottles or receivers of other kinds. The experimental apparatus now in use is capable of producing a thousand cubic feet of oxygen per day. As the demand for the pure gas is limited, the manufacturers have devised a way of dissolving it under pressure in water, in the same way that the so-called soda-water is charged with carbonic acid, and the sparkling liquid thus obtained is said to be refreshing and wholesome.

BESIDES this principal manufacture the Brin brothers have in view the production of ozone from their oxygen. Ozone is, as every one knows, a form of oxygen, in which three volumes of oxygen are by some obscure electrical agency condensed into one volume of a pungent, corrosive gas, useful for bleaching, and for disinfecting organic substances. This change can be effected on a large scale by means of the electrical appliances which are now in use, and ozone is now within the reach of all who can devise ways for utilizing it. The separation of oxygen from the atmosphere liberates great quantities of nitrogen, which air contains in much larger proportion than oxygen; but, although nitrogen in combination is one of the most useful substances in nature, it has as a simple gas little value. The inventor of the new oxygen process have, however, as they claim, discovered a way of inducing the nitrogen which is now set free as a waste product to enter into combination with other substances, especially with hydrogen, which when united with one-third its weight of nitrogen forms ammonia, the great source of plant nourishment. As described, the formation of ammonia from the nitrogen is a very simple matter. A retort is charged with a mixture of carbon and caustic baryta, and heated to a point somewhat above the temperature of boiling water. Nitrogen is then forced through water, so as to charge it with aqueous vapor, and is in that state led into the warm retort. Here the watery vapor decomposes, the oxygen uniting with the carbon and baryta, while the hydrogen is set free, and immediately combines with the nitrogen to form ammonia gas, which can either be drawn off pure, or carried into water or acid solutions, which fix it in a form for use and sale.

SALTPETRE EXUDATIONS UPON BRICKWORK.[1]—II.

F. MARTIN'S STATUE OF THE ABBÉ DE L'EPEE. PARIS.

IT is probably desirable that we should here describe more fully the numerous theories by which the process of nitrification has been explained. The alchemists assumed that because nitre is continually found as an efflorescence upon the surface of the nitrifying matrix that the salt was of ærial origin, and so plausible was this theory that it has more or less been held, even down to the present time. An examination of the nitre caverns of Ceylon induced J. Davy to conclude that the nitric acid was formed from the nitrogen and oxygen of the air. M. Longcamp elaborately enunciated this theory, and explained the production of the nitrogen by supposing that the carbonates of lime and magnesia, taken in a proper degree of comminution, and properly wetted, could absorb air, condense it, and transform it into nitric acid in the course of time; causing it to enter into combination with the lime and magnesia, forming the nitrates of those two substances, and more readily ennabling it to combine with the potassium, especially if it were present in the form of a carbonate. The theory that the combination of the atmospheric nitrogen and oxygen, dissolved in the water of moist porous bodies, oxidized to nitric acid during nitrification was also concurred in by Saussure and Proust. The presence of other matter undergoing oxidation is considered by Clöez to induce such a combination of nitrogen and oxygen, and this chemist states that he believes that this oxidation of the nitrogen of the atmosphere is one of the sources of nitric acid in the nitrification of soil.

It would be possible to extend the discussion of the different theories of nitrification to an almost indefinite length as regards soil, organic matter, etc., which do not come within the scope of this article. But whatever theory may be adopted as to its origin, there appear to be certain conditions which facilitate the production of saltpetre, viz.: a degree of humidity about equal to that of garden earth is very favorable; between 15° and 24° C. (about 60° and 70° F.) nitrification is the most abundant; at 0° C. (32° F.) it does not take place. It seems strange that with the serious objections which exist to saltpetre exudations upon brickwork that there has been found no remedy, and that no particular efforts have been made to obviate it.

The only invention which has been patented with a view to curing these defects, consists in so placing tarred felt as to form a thin wall between the facing and common bricks, and leaving cavities in the top and bottom flat sides of the front bricks, and connecting the pressed-brick wall to the common brick backing by pieces of galvanized sheet-iron, punctured so as to roughen them, and laid between the flat joints of the bricks.

A good method for preventing the saltpetre exudations upon terra-cotta designs consists in treating the back and other portions of the pieces with hot pitch. If the terra-cotta itself should be proof against yielding the saltpetre exudations, that which might otherwise evaporate through the pores of the terra-cotta would be prevented from depositing upon the surface.

During the autumn of 1883, the writer when one day passing by the south front of the new Pension Office Building in Washington, particularly noticed how free it was from efflorescence; but during the same night there was a warm, heavy rain, and in repassing the same front the next morning he noticed the brickwork, which had only attained a height a little above one story, and the elaborate terra-cotta frieze, which girts the building just above the windows of the first story, were greatly disfigured by the unsightly saltpetre exudations which had made their appearance. We do not profess to say that all such formations occur in the night time, or so quickly, but that light greatly retards nitrification is unquestioned. The terra-cotta frieze, girting the building to which reference has just been made has always possessed a peculiar interest for the writer; often has he walked around the building at a convenient distance, studying the whole continuous twelve hundred feet of designs. Some portions of the frieze depict infantry marching; cavalry, artillery, and wagon-trains in motion; sailors embarking on their ships; while other terra-cotta ornamentations of the building represent cannon, shot, and exploding shell. Before the saltpetre exudations appeared, the portions of the terra-cotta work which were in position were of a rich, buff color, and there was apparent animation in the designs. But after the unsightly whitish blotches appeared, no pleasure was to be derived from viewing the work, and for a long time the surface of the frieze seemed to be saturated with water, which made the designs appear dull and uninteresting.

In structures already erected there is probably no method by which saltpetre exudations upon the brickwork can be prevented. It therefore behooves architects and builders to study more closely in the future than they have in the past the nature of such phenomena as have been described in this article, and to seek to remedy them.

One first and important requisite is that there shall be a more exacting inspection given to bricks, stone, terra-cotta, etc., than is usually given to these materials. There is not the slightest room for doubt that a large quantity of such materials find their way into many unsuitable positions in buildings. Porous brick, stone and terra-cotta invite and assist the exudation of saltpetre, therefore such materials should be rejected. Bricks absorbing more than eight ounces of water should not be allowed in the foundation or exposed walls of buildings. A simple way to test the absorption is to weigh a brick and then place it in a bucket of water for five minutes or so; if it weighs, upon removal from the water, more than eight ounces in excess of its first weight, discretion dictates its rejection for the two purposes named. This test applies only to hard-burned bricks, not to salmon stock.

Damp walls, in addition to facilitating saltpetre exudations by drawing upon the mortar with which the bricks are laid, as was explained, also extract the salts from the mortar with which the interiors of buildings are plastered, and evaporating through the pores of the bricks, effloresce upon the surface.

Since dry structures cannot be built with bricks that are very absorbent, and as the extent to which bricks absorb water is of the greatest importance, it is therefore worth while to give a little attention to this subject in the different classes of brick-machines.

The common bricks produced by most of the dry-clay machines absorb much more water than do those made by machines which thoroughly temper the clay. There is too much ignorance displayed in regard to the material produced by this line of inventions, and which enters so largely into the construction of buildings, and this lack of knowledge is often shown by those who ought to know better. In the desire to get up a showy house, "something that will take, you know," mistakes are too often made, and which are usually paid for by the loss of health, and sometimes by the sacrifice of the lives of those who inhabit them. Is it difficult to call to mind houses that people call "unlucky places," in which an unusual number of persons die? These "unlucky places" are for the most part nothing more or less than damp houses, resulting usually from the employment of porous bricks in the construction of the walls.

Architects should remember also the acoustic effects which dampness of walls exerts upon public buildings, by conducing to a very great extent to reverberation, which confuses sound. It is not uncommon for buildings to be hastily constructed, and the internal coats of plastering put on one over the other in rapid succession, and the structures at once occupied for public purposes. But for many months such buildings commonly fail to give satisfaction to the extent that had been hoped from the pains which had been taken to make them acoustically good, although gradually, as such walls part with their dampness, acoustic defects disappear.

It is therefore of the utmost importance that bricks used in such walls be not so porous as to constantly absorb moisture, and for a long period, or permanently, retard the drying out of the walls, of halls for public speaking or for music, while they may answer in other respects, may prove acoustic failures. In this matter architects owe a duty to themselves no less than to their clients and the public. It does not come within the province of this paper to attempt an explanation of this phenomena, which are matters of common observation. In new building it has been recommended to hang up for a few months a little drapery, which may often retard reverberation and be a great aid; it can easily be removed when the moisture disappears from the walls, and the acoustic properties of the structure are assured.

For damp and exposed walls of buildings, bricks have sometimes been glazed or rendered water-proof by a composition which gives them a vitreous surface, and this is done by treating the faces with a flux which meets the silex of the brick; or it may be applied in solution, the liquid being afterward expelled by heat.

Resinous compounds have also been used to render the surface non-absorbent, and bricks have also been treated with soluble silicate of soda, which has been decomposed, leaving the insoluble silex in the pores of the brick. Cheap pigments may be added to the glazing compounds, which will give an ornamental appearance at a moderate cost.

In some cases a glaze which is sometimes employed when the bricks are laid in sanitary positions may be used, and it forms a glass enamel; the components being one hundred and thirty parts of flint-glass powdered, twenty and one-half parts of carbonate of soda, and twelve parts of boracic acid; the surface of the brick being first washed with water containing a small quantity of glue, after which the preparation is applied in solution and fluxed in an oven.

Before closing this portion of our paper, it remains for us to mention the manner in which saltpetre exudations are commonly removed from brickwork. The simplest and least expensive method, when the efflorescences are in positions where the sun and wind do not have free access, is to wash it off with diluted hydrochloric or common muriatic acid of commerce. This acid is very inexpensive; twenty-five cents' worth would be sufficient to clean a front twenty feet wide by sixty feet in height, if such a front was totally covered with the objectionable exudation.

About one-half pound of the acid is used with an ordinary pailful of water, the application being made with a sponge, which can be held in the naked hand or attached to a stick to reach the spots, as

[1] Continued from page 208, No. 462.

may be desired. When the efflorescences have been thus removed, it is perfectly useless, in the present state of knowledge, to attempt to stop a reappearance, for when circumstances are again favorable, the saltpetre exudations will promptly spread themselves over the walls.

It now only remains for us to close this article, after uttering a few words of caution in regard to terra-cotta. Because this form of brick passes through the fiery furnace, and issues from the kiln with a rich, pleasing buff tint, which is usually indicative of thorough firing and good quality, is no excuse for passing it without thorough inspection. The point of any steel instrument is a simple test of the texture of terra-cotta; it should not penetrate the surface, and if the point should strike fire through contact, the ware is all the better. A clear, sharp, metallic, bell-like ring, and a clean, close fracture, are good proof of homogeneousness, compactness and strength.

But there is a deception practiced regarding the obtaining of the above-described appearances in terra-cotta, by employing mixtures of inferior materials, that should be rigidly guarded against. Enormous quantities of architectural terra-cotta are manufactured at great distances from the best clays. In order to save cost of clay and freightage, some establishments on both sides of the Atlantic take advantage of the fact that by mixing ground chalk with ferruginous clays, which may be obtained in almost any location, they are enabled to cheaply produce terra-cotta of a rich buff color.

The material produced in this way is much more porous than that manufactured from the best terra-cotta clays, and consequently invites saltpetre exudations. An additional objection to the employment of such clays is that precision of the forms, which is highly essential, cannot be obtained. Well-manufactured terra-cotta should be uniform throughout its mass, and burnt to the full extent of its contractibility.

The chemical changes which take place in the burning of the best terra-cotta consist, first, of the destruction of the disseminated carbonaceous matter, the dehydration of the silicates of alumina destroying their plastic character; and the decomposition of the disseminated carbonate of protoxide of iron, converting it into anhydrous sesquioxide, to which the buff color of the material is due.

But as we have before stated, the presence of a large proportion of carbonaceous matter in the clay tends to bleaching, by the reduction of the coloring sesquioxide to lower oxide preserved as a silicate in a comparatively colorless condition. Then, again, the presence of lime and the other alkaline earths, which are disadvantageous fluxing elements, will check the coloring power of a large percentage of oxide of iron, by the formation of a pale double silicate of lime and iron. It is this point that is taken advantage of in the mixture of ferruginous clays and ground chalk, to which attention has been invited.

Charles T. Davis.

MUNICIPAL SUPERVISION OF LONDON BUILDINGS.

The direction of matters pertaining to the supervision of building operations in the British Metropolis is principally vested in a body known as the Metropolitan Board of Works, which consists of forty-six members, who are elected by vote of the several Vestries, and hold office until death or resignation. The Chairman and a few of the executive officials of the Board have regular salaries, but the remaining members are not compensated in any manner whatever. The Board has a supervisory power over all the buildings of London, with the following exceptions: All buildings used by railway corporations are subject only to the provisions of the law which gave them their charters, and are not in any way under the jurisdiction of the Board of Works; all public Governmental buildings, jails, law-courts, and museums; all canal and dock companies' buildings; Covent Garden and Smithfield Markets; Greenwich and Bethlehem Hospitals; the Bank, the Exchange, Guild-Hall, and the Mansion-House are taken care of directly by the general government.

The Board of Works appoints district inspectors or surveyors, who personally supervise the erection of all new buildings, and make monthly reports thereof to the Board. In order to be eligible to the position of district surveyor an examination must first be passed before the Royal Institute of British Architects, which body alone has the power to recommend candidates. The surveyor receives no compensation from the Board, but by a provision of the Building Act, he is entitled to collect from the builder of each new building two fees, one when the roof is on, and the other after the completion of the work. The amount of the fee varies from fifteen shillings to five pounds, depending on the size of the building, but never exceeding the latter amount. In some districts the surveyor's position is quite lucrative, occasionally amounting to 3,000 pounds a year. Besides this, the surveyor is at liberty to do as much architectural work as he pleases, provided he fulfils his duty to the Board of Works, though naturally he is not allowed to supervise his own buildings. He is obliged to open an office at his own expense in the district for which he is surveyor. He holds his office for life, or until dismissed for cause by the Board. It will be seen that by this method the cost of the municipal supervision is borne entirely by those who do the building, instead of being distributed as a general tax on the community at large, as is the case in American cities.

The duty of the surveyor is to see that the buildings have good foundations and proper thicknesses of walls, and are built in a thoroughly substantial manner, and in conformity to the statutes of the Building Act. In the case of large public buildings, such as churches, theatres, and the like, the Board of Works exercises an additional power of advising in reference to the construction and planning, none of the buildings of this class being regulated directly by the clauses of the Building Act. The Board appoints for this purpose a superintending architect, and the approval of the Board must be obtained through him, before any such structure can be erected. All expense incurred in obtaining this approval is met by a fee which the builder has to pay.

The Board of Works is also charged with supervising the construction of all public highways and sewers, and the care of the Metropolitan Fire Brigade. It advises Parliament of any new streets or avenues needed, and upon the passage of the necessary Act, takes possession of the requisite sites, and opens the thoroughfare. The Board is empowered to issue bonds to cover the cost of any such improvements. Revenue for the payment of such bonds and interest thereon is derived directly from the general tax returns. It should be said, however, that in the City of London proper, the Board has no jurisdiction over streets or sewers; such matters being regulated by the Corporation Council.

The Board of Works, through its district surveyors is charged with supervision of old or dangerous structures, and a very sensible clause of the Building Act provides that after due notice has been given the district surveyor of any unsafe structure, he shall be responsible for any accidents which may occur. The surveyor has authority to order any dangerous buildings shored up or removed entirely at the expense of the owner.

The Board has no supervision of the sanitary appliances of buildings. These are controlled in the following manner. The various Vestries of the metropolis unite to elect a Board of Guardians which in turn appoints a health officer and local sanitary inspectors, all of whom are paid salaries. But the functions of the Board of Guardians, and its inspectors are limited entirely to the abatement of nuisances. That is to say, a man may put in his new house any kind of sanitary or unsanitary appliance he pleases, and the inspectors have nothing to say. But if such appliance becomes a nuisance, the Board through its inspectors has the power to condemn it, and order its removal. This seems very much to be a case of shutting the stable door after the horse has been stolen away.

When the Board of Guardians, or one of the Vestries, wishes to erect a work-house or asylum or structure of a kindred nature, the plans and arrangement have first to be approved of by the Local Government Board, a purely political body having a general care over the interests of the several local districts. This Board acts through its supervising architect, who is a permanent official. After approval by him, the proposed building is under the supervision of the Board of Works, as previously described.

All buildings pertaining directly to the general government, such as palaces, the Houses of Parliament, etc., and all crown lands and parks, are under the immediate care of the First Lord Commissioner of her Majesty's Works, who is a member of the Government. The real work is done by the permanent secretary, inspector, superintendent, etc., and their aids, who have entire charge of all repairs, additions, or changes which may become necessary. They are a law unto themselves, being accountable only to the Queen and the Parliament. They employ architects to prepare plans for, and superintend new buildings when necessary, though all other work is mostly laid out by draughtsmen regularly employed by the Commissioner.

The Acts regulating the construction of new buildings are very numerous, and scattered through a period from the time of Charles I to the present year. In the main, the provisions are essentially such as are in force in Boston or New York. There are some special clauses, however, worth noting as not often found in American laws. Thus, chimneys cannot be built higher above the roof than a height equal to six times the least width of the chimney-shaft, unless such shaft is built with and bonded to another not in the same line. Also it is specified that no timber-work shall be placed nearer than twelve inches to the inside of any flue; or under any chimney opening within eighteen inches of the surface of the hearth; or within two inches of the masonry of the flue, if the walls are eight-and-a-half inches thick, or less.

Separate sets of chambers tenanted by different persons, if in a building exceeding 3600 cubic feet contents, must be divided vertically by party-walls, and horizontally by party-arches or fire-proof floors. The law also prescribes that every warehouse or other building used for trade or manufacture containing more than 216,000 cubic feet, shall be divided by party-walls in such manner that the contents of each division shall not exceed 216,000 cubic feet.

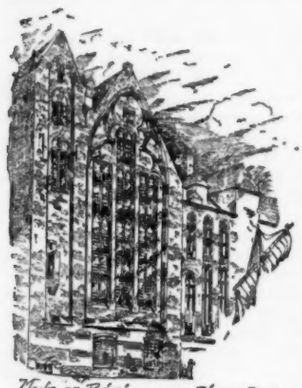
The thickness of walls is carefully regulated, and a clause is added that this thickness must be at least equal to one-sixteenth of the

height of the story, in ordinary buildings, or one-fourteenth in warehouses, though the additional thickness beyond what would be required for a low story may be put into piers, of which the collective widths must equal one-fourth of the length of the wall. The foundation footing-courses must have a depth, and offset on each side equal each to one-half the thickness of the wall at the base.

The Acts leave a great deal to the discretion of the surveyor, nothing being said about loads on floors, or the calculation of strains. He has it in his power to pass a great deal of poor construction if he is so inclined; but whether British surveyors are unusually conscientious men, or British builders little prone to offer bribes, certain it is that the municipal supervision seems to be very careful and thorough, and honest in all its details; and though the working machinery seems heavy and complicated, it suits London, and the architects and builders do not seem to feel the need of any change.

C. H. BLACKALL.

BUILDING STONES.



MONT DE PIÉTÉ ADJOINING NOTRE DAME, BRUGES, BELGIUM.

IN the selection of stone for building, it should be borne in mind that in some localities certain varieties of stone will not last, which in others would last for centuries. For instance, a stone containing much lime would soon crumble and deteriorate if placed in a wall subjected to the uninterrupted action of sulphurous fumes, or in thickly-populated sections where bituminous coal is used, the smoke of which, freely saturated with sulphur, coming in contact with the hydrogen of ordinary atmospheres develops sulphuric acid, and the lime inviting it soon loses its tenacity and the stone crumbles. Again, another kind of stone, not having lime, may be unfit for building in localities where the cold is intense at one time, the atmosphere moist at another, and warm at another; the stone may be porous, and as the moisture comes in contact it is readily absorbed, and when the weather moderates, after a severe cold snap, a gaping fissure is seen in some corner or coping stone, and often an entire wall is thrown out of true. Then a stone showing traces of organic matter will furnish a good foothold for mosses and lichens, and in a few years the tendrils completely fill all the interstices; eventually they yield to the pressure of vegetable growth, and a ruined stone results. Finally, a stone to be valuable for building purposes must possess properties of unequal expansion, contraction and pressure. When the weather is at zero, we warm our buildings; hence a stone bearing a weight of a hundred tons or more has one portion exposed to zero or below, and the other to a temperature of from 60° to 70°, and a good stone it is that will withstand this wrenching, pulling and crushing, without yielding somewhat at that particular point where these two forces meet.

Stone, then, being subjected to so many and often adverse influences, should be well understood by the one who pays the bills before the product of any quarry is adopted. Experience has proved that stone from the different strata of the same quarry will often present diversified chemical and physical features. Often the trace of magnesia, lime, etc., so plain and reliable at the opening of a quarry, will disappear during progression of the same strata. In laboratory practice a great variety of stone is submitted for examination, and as many questions asked. There have been some twenty-six varieties received by me during the past month, from the testing of which some interesting facts were deduced in determining the amount of heat building-stones will stand, and the results will be of interest to dealers. The investigations, all told, cover twenty-six kinds of granite, twenty-three of sandstone, seven of lime-stone, seven of marble, three of conglomerate, one of slate, one of soapstone, and one of stone artificially prepared.

Under the application of heat, the granite began to yield at a temperature between 700° and 800° Fahrenheit, the second example became cracked at 900° Fahrenheit, another became generally cracked when subjected to a heat from 800° to 950° Fahrenheit, and the fourth was rendered worthless on reaching 1000° Fahrenheit, or thereabouts. From all these tests we have made an unbiased average, which we present in the table below, and those, also, for the other kind of stone, the stages of destruction being indicated by the figures mentioned in the foregoing statements: —

Granite.....	700	to	800°	800	to	900°	800	to 950°
Sandstone.....	800	to	900°	850	to	1,000°	900	to 1,000°
Marine limestone..	800	to	950°	900	to	1,000°	900	to 1,000°
Marble.....	900	to	1,000°	950	to	1,100°	1,000	to 1,200°
Conglomerates.....	600	to	700°	700	to	800°	800	to 900°

at or below	1,000°		
1,000	to	1,200°	
mostly.....		1,200°	
		1,200°	
900	to	1,000°	

The specific gravity of the granites ranged from 2.600 to 2.727, excepting one example from Stansted, Canada, which showed a specific gravity of 2.833, and, as we immersed in distilled water and determined by displacement, the samples doubtless gained in weight by absorption. This increase of weight ranged from 1.283 to 1.818 of the original weight.

In the case of sandstone, the specific gravity ranged from 2.168 to 2.661, but the majority was under 2.400, and the absorption was 1.17 to 1.80, except two which gave 1.240, a freestone from Nova Scotia, and the Montrose stone from Ulster County, New York, which 1.118 represented. For the marble the specific gravity was from 2.666 to 2.8485, and the absorption 1.800 to 1.380 for the more solid; while the marine limestone gave a specific gravity of from 2.478 to 2.706, and the absorption was 1.280 to 1.480. These tests will show the builder which stone and variety of stone is best adapted to resist the influences mentioned as existing in their respective locality.

Again, there are other characteristics than these that stone must possess in order to be suitable for the varied uses to which building-stone is put. Among these characteristics may be mentioned strength. Indeed, this may be considered as a principal characteristic for specific purposes; but as their strengths vary in kinds, it is plainly a matter of the greatest importance that this be understood fully before laboratory tests are of any use to the architect or builder.

Concerning what is called actual strain, the trap-rocks of New Jersey furnished the best specimens we received. These samples would stand a pressure of about 2,400 pounds to the cubic inch; but one specimen of dolerite, from Staten Island, New York, we think would be equally good, but we had the misfortune to break the tester before completing, and not having a duplicate, could not complete as intended. This stone, however, is used only to a limited extent, inasmuch as it is very expensive, save in cyclopean architecture, where the blocks are fitted together roughly.

Regarding the granites, they have been used now sufficiently long to be considered regular standbys. The best and strongest specimens tested — and we had samples from almost everywhere — came from Rhode Island; Richmond, Virginia; and Port Deposit, Maryland. These will severally stand a pressure of 17.750, 21.250, and 19.750 pounds to the cubic inch. Of all the stone in general use, we consider the granites the most desirable; besides, they are the simplest and the richest. These stones, however, like all others, have their undesirable properties, but so far as durability is concerned, glass would be about the same. Of the red granites the best specimens come from Peterhead, not far from Aberdeen, Scotland, and a few good blocks come from the Bay of Fundy.

It is a common impression that nearly all our marble is imported, but this is a mistake. The strongest marble we have yet found came from the town of Lee, Mass., and bears a strain or pressure of 13,440 pounds to the cubic inch. Samples of marble from Tuckahoe, N. J., stood a pressure of 12,950 pounds to the cubic inch, a pressure much better than the sample from the Bay of Fundy; this only bears a pressure of 11,812 pounds to the cubic inch. Common marble from Staten Island stands a pressure of 11,250 pounds to the square inch, while statuary marble from Carrara responds to a pressure of only 9,723 pounds to the square inch.

With reference to the colored stones so much admired, the limestones are the most valuable, for the great variety they present. This stone is found in many localities. Those at Kingston, New York, and Bedford, Indiana, are about the same as regards strength, while Glen's Falls, New York, produces the finest variety of colored limestone in the world, it being so black it will reflect hardly a shadow, and takes a very high polish. Lockport, New York, produces a very fine gray variety of limestone, and the delicate cream and clove-colored varieties come from Athens and the Caen quarries. The "Indiana tints," though less delicate, are a stronger and more durable variety of limestone. For ornamental artistic work the finest stone comes from Florida and the Bermuda Islands.

Another quite striking peculiarity is possessed by limestones from some localities; many of them change greatly after being dressed. For instance, when some of the fine grays are trimmed with a hammer they resemble a light granite, and make a beautiful and durable trimming for brick houses. The curious cream stone from some localities is quite soft at first when quarried, but soon hardens on exposure, growing more durable with age. In this respect a stone now being quarried near Topeka, Kans., is among the best we have seen; it is first sawed into any desired shape, and soon gets nearly like iron in hardness. As to the most noted and valuable quarries of limestone, there are many now being worked to a very wide extent. Dayton, Ohio, keeps the builders of Cincinnati busy with stone. Bedford, Bloomington, and other portions of Indiana ship stone north, south, east and west, hundreds of miles, and of Indiana's stone the half has not yet been told. Along the L. E. & St. L. R. R. are acres and acres of undeveloped quarries, which, when properly worked, will rank among the best in the country. The favorite stone among the builders seems to be the Athens, from northern Illinois, and a test of samples from these quarries proves the correctness of the theory advanced before, for here we have a stone that physically will stand moisture and frost; chemically it will respond but feebly to the action of bituminous coal-smoke, besides presenting a fair resistance to unequal pressures. For resisting fire, a sample from St. Geneviève, Missouri, was found, a very fine-grained, straw-colored stone, and, though light, it stood a pressure of 50,000 pounds to the square foot.

Probably one of the strongest varieties of stone found in America came to us from Salt Lake, Utah. It is known and recognized there as hell-fire rock. This stone, when scratched in the dark, gives out a brilliant flash of light, or rather, when exposed to friction it illuminates, not like the spark from flint, but in broad streaks of illumination.

Many other samples received possessed many striking characteristics, but so far as their value for building purposes is concerned, the above is about all we could prove by a week's hard laboratory work.

J. F. Elsom.

THE ILLUSTRATIONS.

CHURCH OF ST. CROIX, BORDEAUX, FRANCE.

THE façade of this church, which dates from the twelfth century, is said to be the only interesting feature about the building. As shown by the illustration, the greater part of the front has been recently restored.

GARDENER'S COTTAGE FOR CHARLES DANFORTH, ESQ., PATERSON, N. J. MR. CHARLES EDWARDS, ARCHITECT, PATERSON, N. J.

SKETCH FOR A SEASIDE COTTAGE. MR. S. S. WOODCOCK, ARCHITECT, BOSTON, MASS.

FIRST CONGREGATIONAL CHURCH, NORWOOD, MASS. MESSRS. HARTWELL & RICHARDSON, ARCHITECTS, BOSTON, MASS.

HOUSE FOR LEONARD WARE, ESQ., ROXBURY, MASS. MR. S. PHIPPS, ARCHITECT, BOSTON, MASS.

A BRIDGE NEAR ROME, ITALY.

THE FIRST STEAMER TO CROSS THE OCEAN.

ONE of the most curious things in the history of transatlantic steam navigation is the claim that has been set up on the other side of the water to the construction and fitting out of the first of pioneer transatlantic steamers, or, more strictly speaking, to the proprietorship of the first vessels which crossed the ocean propelled exclusively by steam-power. These pioneers, it is claimed, were the *Sirius* and the *Great Western*, the former built for another class of voyages and afterward lost on the station between Cork and London; the latter built expressly for Atlantic navigation. They made the voyage in 1838, which, as will be seen, was twenty years too late for pioneers. If "exclusively propelled by steam power," as is urged for them, means that no sails were set during the passage, the claim may be founded on fact; but that it is deceptive and misleading there is surely no doubt. The *Savannah*, an American steamship, was surely the first ever built to cross the ocean, and, if she carried auxiliary sails and set them when the wind was fair, she did no more than every steamer has done from that time up to the present, and could by no means be forced on that account to forego her claim to being the first steamship that crossed the seas. She was built in 1818, by Col. John Stevens of New York, and the news of her master's intention to tempt the seas soon reached the English world, being heralded by the *London Times*, in its issue of May 11, 1819, in the following paragraph: "Great experiment. — A new steam vessel of three hundred tons has been built at New York, for the express purpose of carrying passengers across the Atlantic. She is to come to Liverpool direct." This was the *Savannah*, which, in May, 1819, left the port of New York, under the command of Captain Moses Rogers, bound for St. Petersburg *via* Liverpool. She reached the latter port on June 20, having used steam eighteen days out of the twenty-six, and thus proved the feasibility of transatlantic steam navigation.[1] The log-book of the *Savannah*, in which Captain Rogers jotted down the incidents of the trip, is yet preserved by his descendants.

It is a curious collection of coarse, unbound paper pages, written in a bold and intelligible hand. On the first page is the following: "A journal of a voyage from New York toward Liverpool on board steamship *Savannah*, Moses Rogers, master." Here is the first entry in the log-book: "Sunday, March 28, 1819.—These twenty-four hours begin with fresh breezes at Northwest. At 10 A. M. got under way for sea with the crew on board. At 1 P. M. the pilot left the ship off Sandy Hook light." The second entry reads: "Remarks on board, Monday, March 29, 1819. These twenty-four hours begin with fresh breezes and clear. At 4 P. M. the Highlands of Neversink bore north by west six leagues distant, from which I take my departure. At 10 P. M. took in top-gallan' sails. At 8 A. M. tacked ship to the westward. Saw a brig and schooner steering to the westward. At 11 A. M. took in the mizzen and fore top-gallan' sails. At 11 A. M. got the steam up and it come on for to blow fresh. We took the wheels in on deck in thirty minutes. At meridian to-day fresh breezes and cloudy. Latitude by observation, 39 degrees, 19 minutes." It seems that the *Savannah* was so constructed that, when there was a heavy sea running, the paddle-wheels could be taken in on deck. This was done by rigging a sling from the main yard, which being swayed about, could be forced first over one wheel and then over the other. Now began a short season of very rough weather, during a part of which the *Savannah* was hove to. On the following Saturday, however, the weather being moderate, the wheels were again shipped and the vessel proceeded under steam.

After an uneventful voyage the coast of Ireland was sighted, and early one morning the *Savannah* approached the land. That afternoon she was boarded by the king's cutter, *Kite*, Lieutenant John Bowie. The log-book says little about this, but Moses Rogers's brother Stephen wrote an account of this amusing incident, which was published in the *Gazette*, of New London, Conn. He says: "She (the steamer) was seen from the telegraph station at Cape Clear, on the southern coast of Ireland, and reported as a ship on fire. The admiral, who lay in the cove of Cork, despatched one of the king's cutters to her relief. But great was their wonder at their inability with all sail, in a fast vessel, to come up with a ship under bare poles. After several shots were fired from the cutter, the engine was stopped, and the surprise of her crew at the mistake they had made, as well as their curiosity to see the singular Yankee craft, can be easily imagined. They asked permission to go on board, and were much gratified by the inspection of this naval novelty." Two days later, according to the log, they shipped the wheels and furled the sails, and ran into the river Mersey, and at 6 P. M. came to anchor off Liverpool. Captain Rogers seems to have been as modest as he was daring, for, though having succeeded in an attempt to navigate the ocean with paddle-wheels, which many of the ablest mariners and scientists had declared perilous if not impossible, he only jots down in his log-book a few dry details of his safe arrival, with never a comment.

A distinguished scientist had declared long before that it was not possible to cross the ocean by steam. Indeed, so sure was he that it could not be done that, when he heard that Captain Rogers proposed to make the attempt, he declared that he would swallow the first vessel that should safely reach the British Isles from this country. It would not, therefore, have seemed immodest had Captain Rogers, upon the arrival of the *Savannah*, have called upon the savant to fulfil his promise and swallow the ship. Fortunately, the aforementioned Stephen Rogers wrote an account of the scenes along the quays and river when the steamship drew near the shore. He says: "On approaching Liverpool, hundreds of people came off in boats to see the steamship. She was compelled to lie outside the bar until the tide should serve for her to go in. During this time she had her colors all flying, when a boat from a British sloop-of-war came alongside and hailed. The sailing-master was on the deck at the time and answered. The officer of the boat asked him, 'Where is your master?' to which he gave the laconic reply, 'I have no master, sir!' 'Where's your captain, then?' 'He's below. Do you wish to see him?' 'I do, sir.' The captain, who was then below, on being called, asked what he wanted, to which the officer answered, 'Why do you wear that pennant, sir?' 'Because my country allows me to, sir.' 'My commandant thinks it was done to insult him, and if you don't take it down he will send a force that will do it.' Captain Rogers then exclaimed to the engineer, 'Get the hot-water engine ready.' Although there was no such machine on board the vessel, the order had the desired effect, and John Bull was glad to paddle off as fast as possible. On approaching the city, the shipping, piers, and roofs of houses were thronged with persons cheering the adventurous craft. Several naval officers, noblemen and merchants from London came down to visit her, and were very curious to ascertain her speed, destination and other particulars."

It is curious, in looking over the English newspapers of this time, to see how suspiciously the English authorities regarded the American steamer. America was looked upon as very ambitious, and an enterprise like this on the seas filled the British breast with great alarm. It seems that Napoleon being now in captivity in St. Helena, his brother had offered a large reward to whoever should rescue him, or rather there was, it would appear, a rumor to that effect, and the British press was sure that this Yankee steamer was in European waters for no other purpose. The *Savannah* remained nearly a month in British waters, and while there Captain Rogers had jotted down in his log the following note of an unfortunate occurrence. It is here given literatim: "July 19, 1819. These twenty-four hours begin with fresh breezes and rain. Captain Rogers told Mr. Blackman to go on shore after James Bruce and John Smith to get them on board. They would not come; the watchman put them in the boat. John Smith tried to knock Mr. Blackman overboard; Struck him several times; he Swore he would take Mr. Blackman's life, but Mr. Blackman got him on board, and he denied his duty, and then he was put in irons. Middle and latter part fresh gales at S. W. and rain." On the 22d of July the *Savannah* set out for St. Petersburg under steam. She stopped at Copenhagen and also at Stockholm, where, as in England, she was the object of general attention, being visited by all the members of the royal family and the nobles. Captain Rogers's diary says: "Mr. Huse (Christopher Hughes), the American Minister, and Lady and all the Furran ministers and their Ladyes at Stockholm came on board." At St. Petersburg, where the steamer arrived in the early part of September, she was visited by the Lord High Admiral and members of the royal family. She sailed for America on October 10, and reached Savannah, Ga., November 30. While at Stockholm, Captain Rogers took aboard as

[1] These dates cannot be reconciled with those in the log-book. — Eds.

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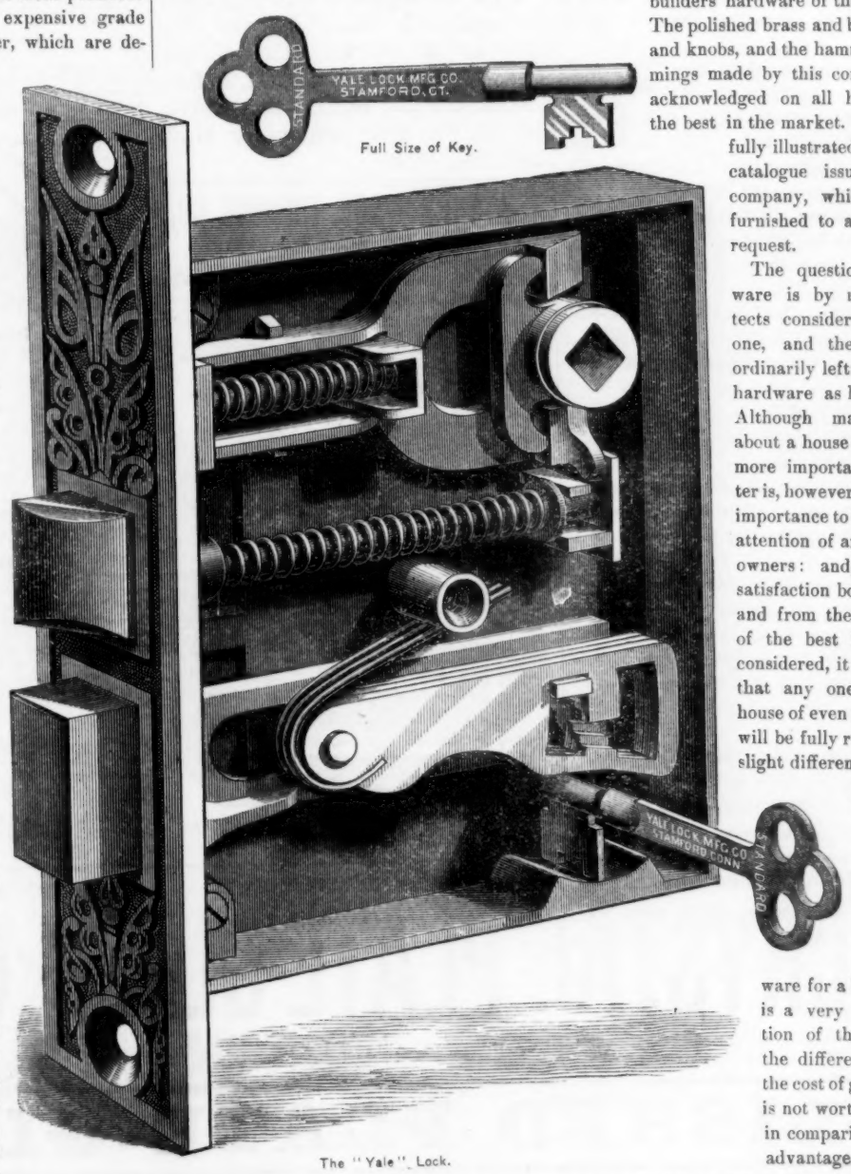
YALE LOCKS.

We illustrate herewith one of The Yale & Towne Manufacturing Company's Standard Locks. This is one of a line of locks produced by this Company of a less expensive grade than the Yale Locks proper, which are designed for general use throughout a house both for inside and outside doors, and also for office doors, etc. While the construction of these locks enables them to be sold at a less price than the Yale Locks, they are designed to occupy the same position with regard to the ordinary house locks that the Yale Locks do to other locks of their class, that is, the Standard Locks are intended to be the best of their class. As in all the productions of this Company, the workmanship and material are first-class throughout. By reference to the illustration, which shows the interior of the lock, it will be seen that it is provided with three tumblers or levers, which give great security against picking. In this respect the Standard Locks differ from ordinary house locks, which latter can ordinarily be opened by any piece of wire. These locks, on the contrary, are sufficiently secure for use as night latches or front-door locks. It will be seen that the latch and knob are provided with long easy springs, so that the action of the latch will be very smooth and easy. The bolt is heavy, while the key is all steel, nickel-plated, which enables it to be light yet strong, and of a size which can easily be carried in the pocket. The illustration shows an ornamental bronze front, but the front of the lock can be made of polished brass or bronze, or of any desired style of finish. It is often said that any kind of a lock is good enough for the inside of a house, but a little reflection will show the fallacy of such an idea. Of course, the primary idea of a lock is security, and it is at least of some value when even an inside door is locked to know that it cannot be opened with an ordinary piece of wire. No one will deny that it is extremely annoying to have to slam a door in order to shut it, which is always the case with ordinary locks, which are loosely fitted up, and with short and hard springs, and with a badly-shaped latch. And, finally, it does not seem proper that a handsome door should be spoiled by the use of a poor lock and trimmings.



The "Yale" Lock.

In addition to the Standard Locks, The Yale & Towne Company makes a full line of builders' hardware of the best class. The polished brass and bronze butts and knobs, and the hammered trimmings made by this company, are acknowledged on all hands to be the best in the market. These are fully illustrated in the new catalogue issued by the company, which will be furnished to architects on request.

The question of hardware is by many architects considered a minor one, and the builder is ordinarily left to use such hardware as he thinks fit. Although many things about a house are perhaps more important, this matter is, however, of sufficient importance to be worthy of attention of architects and owners: and, when the satisfaction both from use, and from the appearance of the best hardware is considered, it seems clear that any one building a house of even medium cost, will be fully repaid for the slight difference in the expense of the Yale hardware over the cost of poor goods. The total cost of the best hardware for a house always is a very minute fraction of the cost, and the difference between the cost of good and poor is not worth considering in comparison with the advantages obtained.

THE YALE & TOWNE MANUFACTURING CO.
STAMFORD, CONN.

HOW GRANITE IS CUT.

"How do you cut granite?" was asked of Mr. J. C. Smith, foreman of the Hallowell Granite Company, yesterday.

"Well, we'll start at the quarry. A number of what are called 'Lewis holes,' say from four to twelve, are drilled in the rock to a depth of from four to twenty feet, according to the size of block desired. These holes are filled with blasting powder, the explosion of which will start off a stone weighing perhaps 200 tons or more. This stone can be cut in any shape almost as readily as ice, by what are called 'plug holes.' They are $\frac{9}{16}$ of an inch in diameter, and about 3¼ inches in depth, and are drilled from three to six inches apart, so as to form a line, straight or curved. Into each of these holes are placed two half-rounds of steel, tapering at the top. Between these half-rounds a wedge is placed; the wedge a little shorter than the half-rounds, say 3½ inches long. The wedges are struck, one after another, with a hammer weighing about five pounds, care being taken to keep about the same strain on each wedge, and are driven in until the stone is forced apart. If the plug holes are made to form a circle, the effect will be the same. Occasionally we separate large blocks by 'deep holes,' which are similar to plug holes (and operated in the same way), only very much deeper, say from five to six feet deep."

"You must require good tools."

"We do. The drills with which we make plug holes are constructed of one-fourth octagon best English steel. They are wedge-shaped, and flaring at the end, and when new, from eighteen to twenty inches in length. A man can use one about twenty minutes, and it then has to be sharpened. We have eight blacksmith shops in constant operation for sharpening tools."

"How many kinds of granite do you work?"

"Twenty-three; Hallowell, Fox Island and Jonesboro' are the principal ones. A few of the others are Addison, Dunshane Hill, Spruce Head, Red Beach, Quincy, Rockport, and McDavy. These are all used for building and monumental work. They are all native granite except the McDavy, which comes from the Provinces. We do not use any Scotch granite, for we find the Jonesboro' is better."

"For turning granite columns, we have a patent machine very similar in general principle to a turning lathe. It is the only one of the kind in this country, and we can do with it in ten minutes what it would take a man all day to do by hand, and it will do it better too."

"How do you polish granite?"

"To put a very high polish on a stone we take a mould of it in plaster, and from this mould have an iron casting made. This we attach to one of our machines, and we send sand and water under it until all the depressions are removed from the stone. The stone is then washed and polished with emery. We make the polish still more brilliant with felt and putty. We do some hand polishing by the same process."

"Those heavy pieces of granite must be difficult to handle."

"Not as difficult as you imagine. We hoist all our valuable polished pieces by means of what is called a 'Lewis.' A hole is drilled in the rough bed of the rock, wider at the bottom than the top, and into this are placed a number of little pieces of iron, wedged closely together, with a hole through the top of each. Through these holes a shackle is run, and the stone is ready for hoisting. It is quite an ingenious device, and is of great assistance to us, doing away with the necessity of chains, which are apt to seriously mar a polished surface." — *Boston Globe.*

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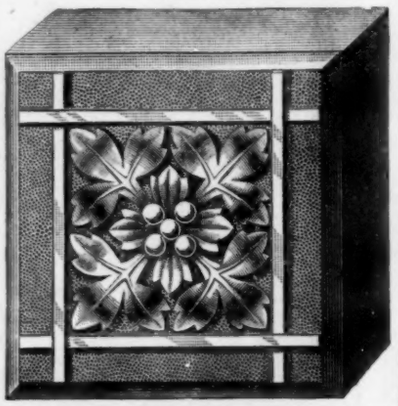

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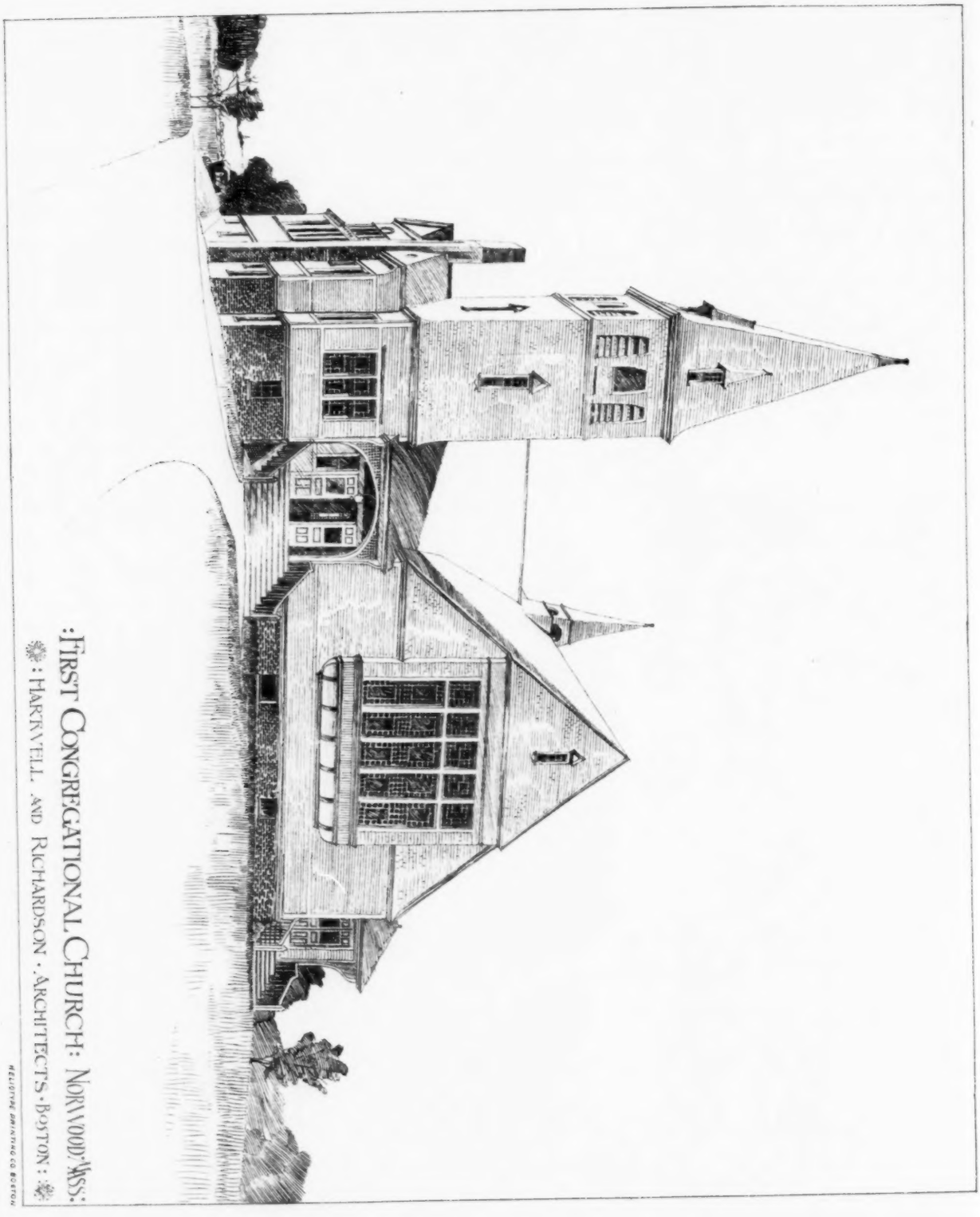

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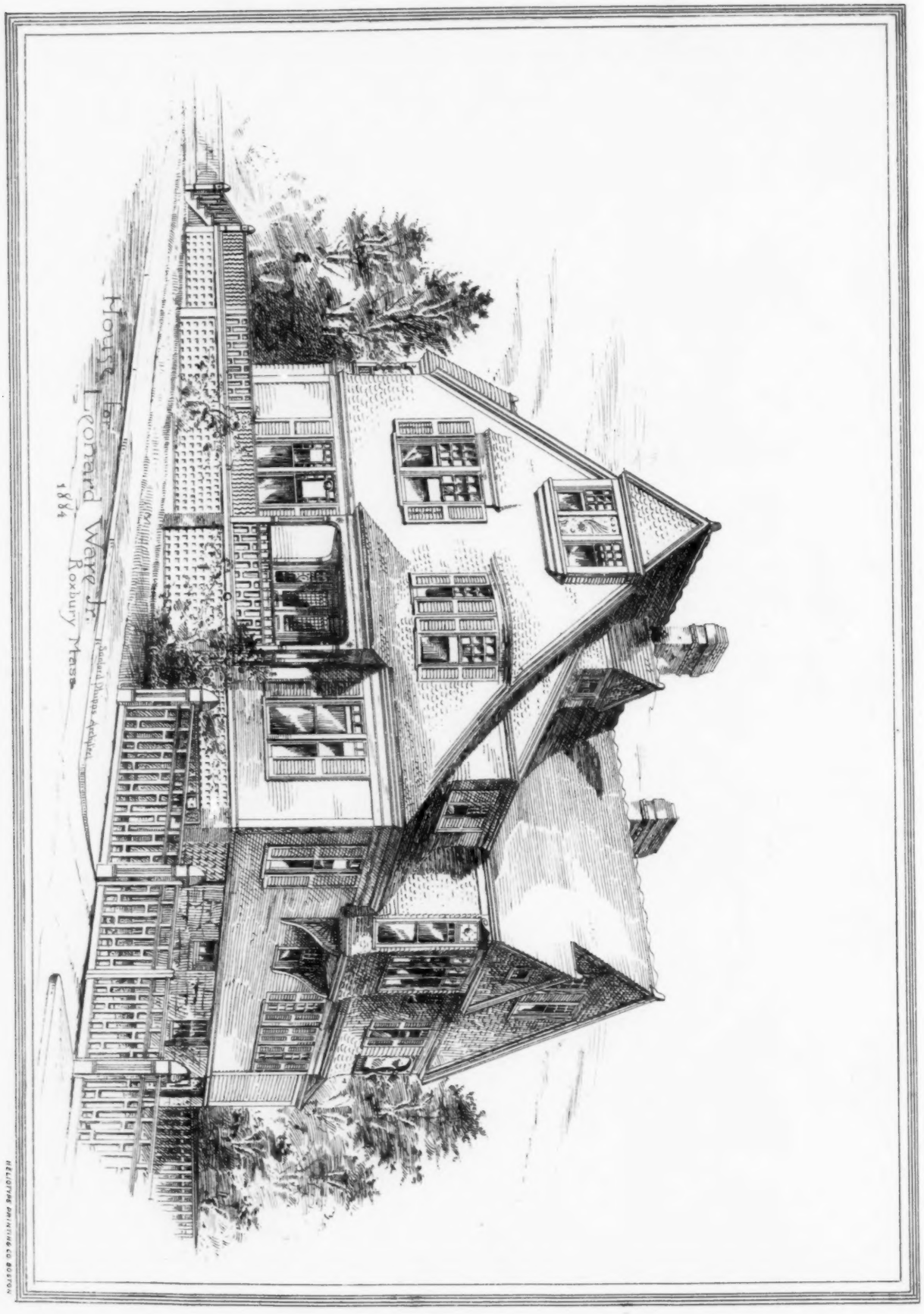

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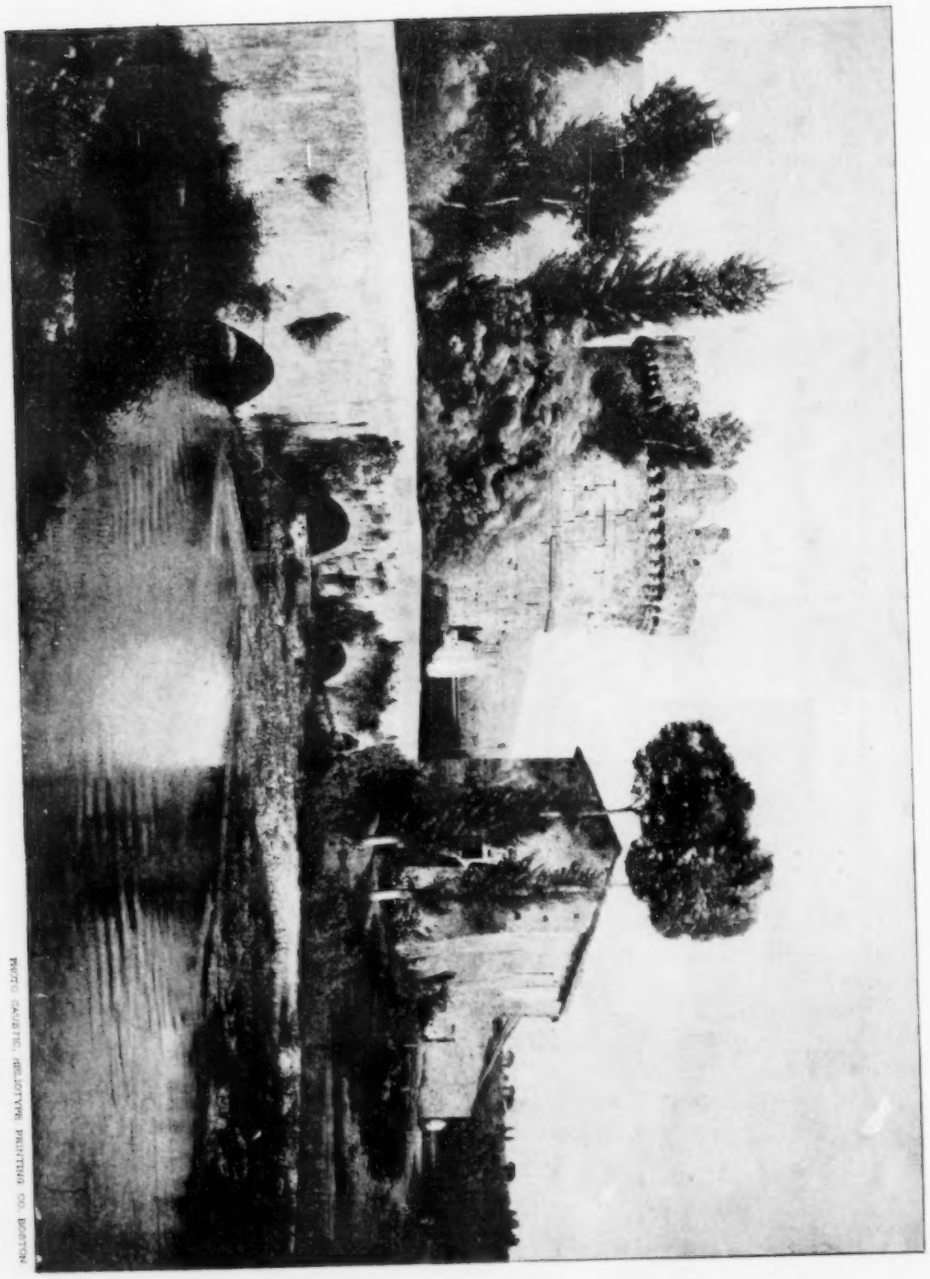

BRIDGE NEAR ROME

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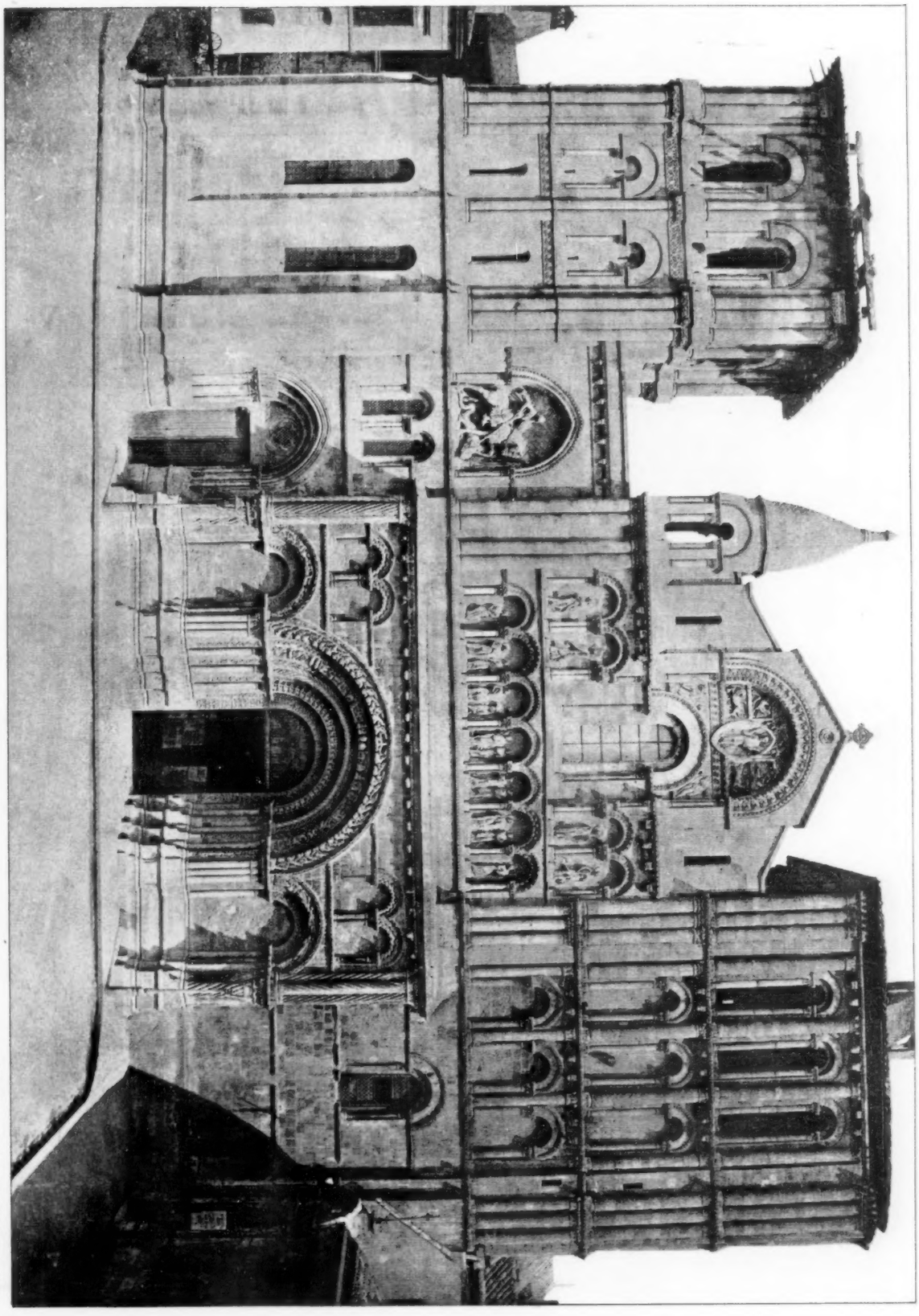

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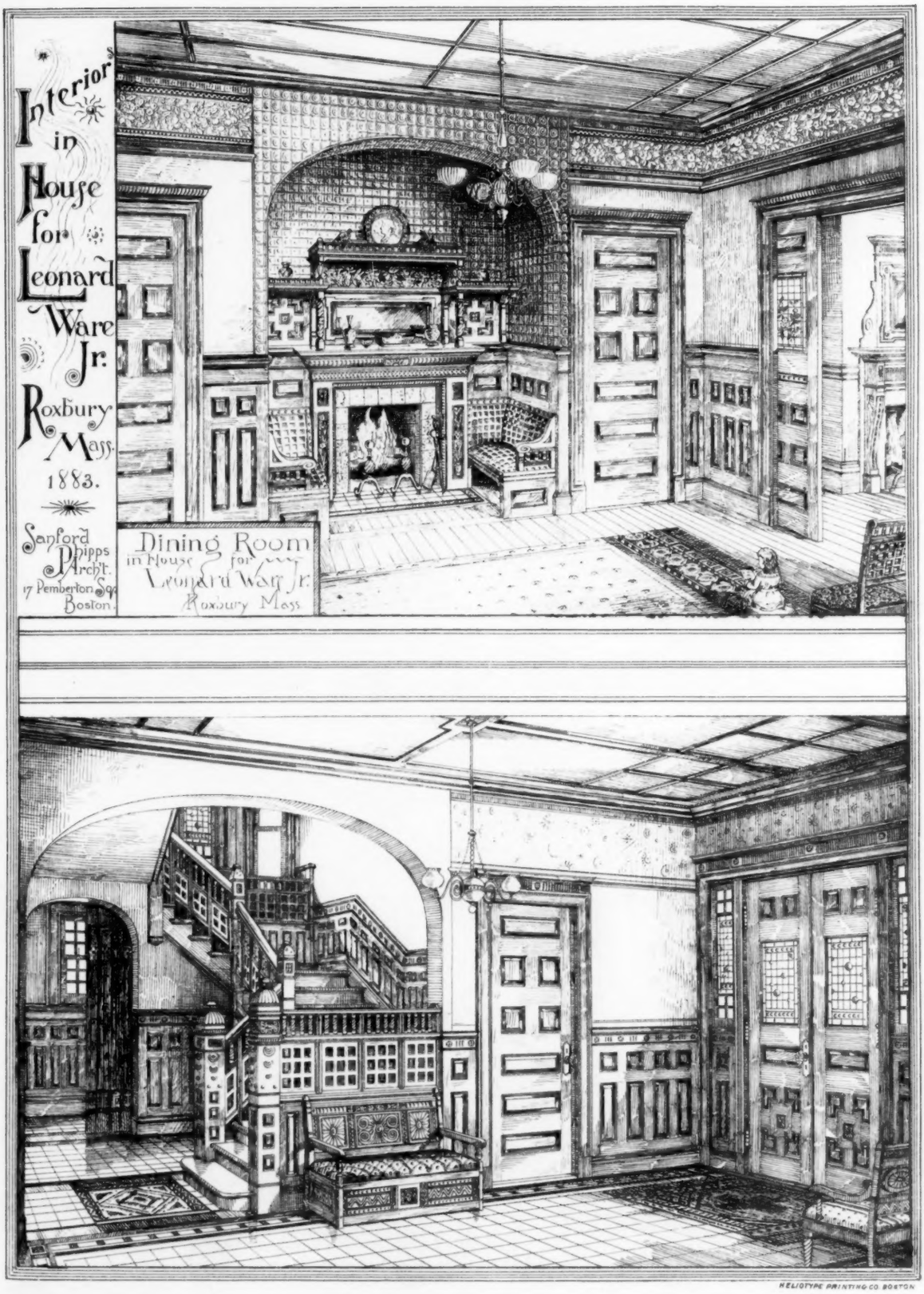

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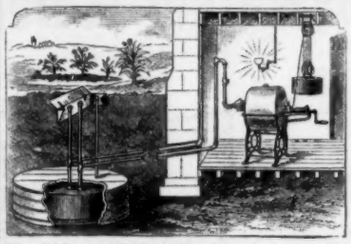

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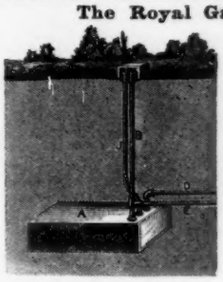

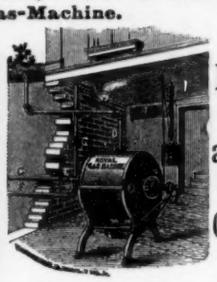

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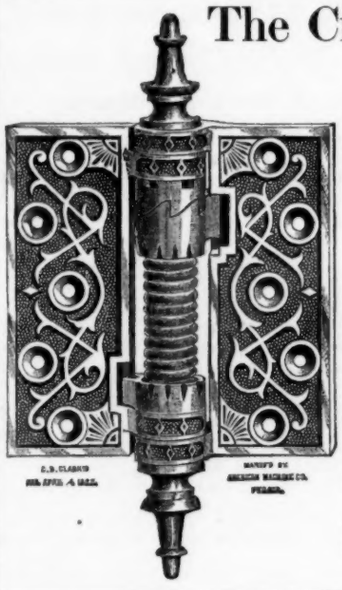

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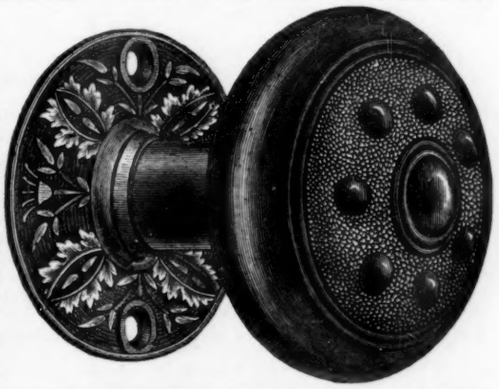

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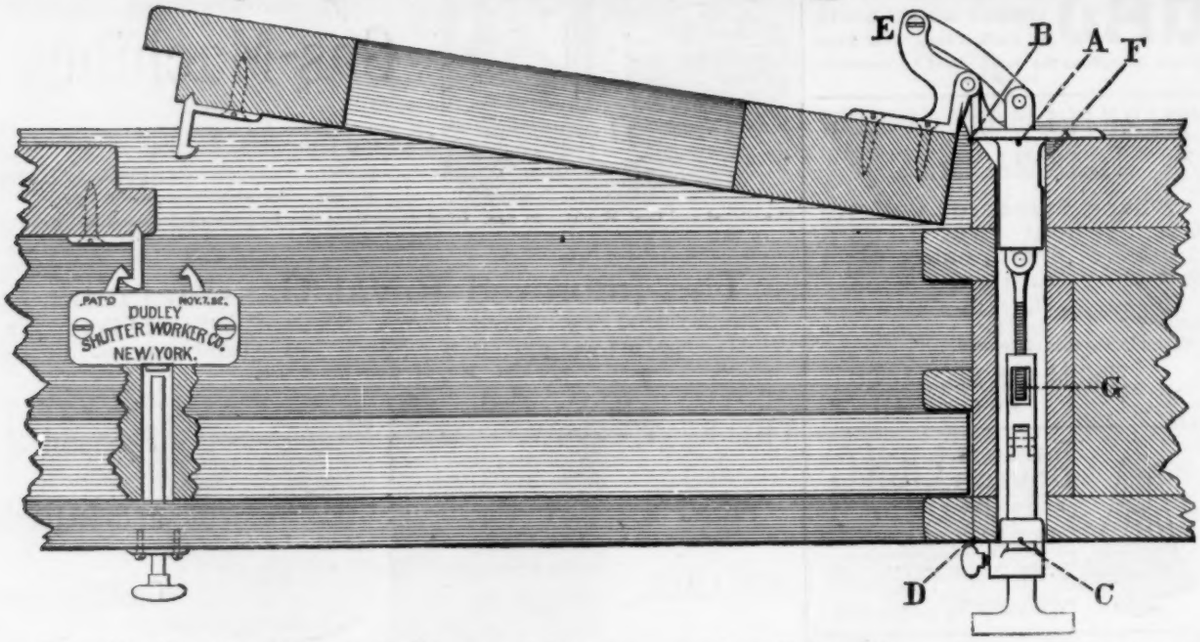

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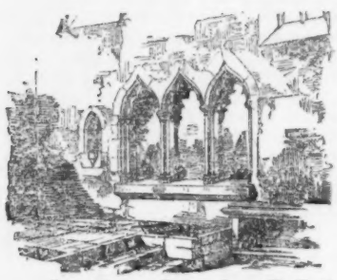
an invited guest Lord Lynedock, an English nobleman, who made the journey to St. Petersburg aboard the steamer. When he left the ship, he presented Captain Rogers with a massive gold-lined tea-kettle. This tea-kettle is yet preserved by the descendants of Captain Rogers. It bears the following inscription:

"Presented to Captain Moses Rogers, of the steamship *Savannah* (being the first steam vessel that had crossed the Atlantic), by Sir Thomas Graham, Lord Lynedock, a passenger from Stockholm to St. Petersburg — September 15, 1819."

Thus it will be seen that the *Savannah*, which, by the way, was lost off the south side of Long Island, anticipated the alleged steam pioneers *Sirius* and *Great Western* by nearly twenty years. — *N. in the Brooklyn Eagle.*

THE WALL.[1]



Sedilia at Pavia: Etchings from Ch: Engd

HAVING now looked a little *at* our wall, let us try to look *into* it as far as we can, and perhaps an architect can look farther into a stone wall than some other people, notwithstanding the old proverb. What then are walls made of? You may lay it down as a general rule that a wall must be made of something that lies ready to hand. In many cases the fact that the material of which some small ornate object is to be made comes from far is a point in its favor. We prefer Italian marble to Derbyshire, or to the serpentine of Cornwall, not because they are always more beautiful (for they are not), but because they are Italian. But for wall building so much and such heavy stuff is wanted that it never does to bring it far. Accordingly, in localities where nothing else is to be had walls are built of earth. In Devonshire, for example, cottages, barns, and the walls of gardens and orchards are commonly of earth, and they are warm, solid, and, if well taken care of, durable; but moisture must not be allowed to get into the heart of them, or they will soon crumble. Next to earth is a material not, so far as I am aware, known in England, but once in use in the East — sun-dried bricks. Vitruvius says that the walls of Babylon were built with sun-dried bricks laid in bitumen; and it is supposed that they were largely used in Assyria and Babylonia, and that some of the shapeless mounds which now mark the site of ancient structures consist of a mass of what was once sun-dried bricks. Next, of course, we should come to bricks — the material only too familiar to the London eye, and the refuge of builders throughout the world, and of every age who, like the London builder, were not so fortunate as to have stone within reach. In Egypt and many parts of Italy there are remains of brickwork of great antiquity, and in Lombardy, North Germany, France, Belgium, and our own country brick has been extensively used, and is in use at the present day. I should occupy the entire evening if I told you, as I hope to tell the students of the constructive courses, only very hastily how bricks are made and burnt, what are good and what bad, and how they are to be laid in a wall. I can, I think, only remark that bricks are not always of the sizes and shapes we are familiar with. The Romans made them flat, more like our tiles, and in many European countries they have been used considerably smaller. The size is a good deal influenced by the weight. An English brick can be held and managed by an artisan with one hand. If it were much larger or much heavier it would take two hands, or even two men, as were probably employed on the Roman bricks. The most refined kind of brick is called terra-cotta. It is of the nature of brick, but bears the same kind of relation to it that marble does to stone, or silver to pewter. Terra-cotta is, in theory at any rate, the most appropriate ornamental substance to employ with brickwork, and though there are some practical difficulties in the way of using it, when these are overcome it is an admirable material. The best and most desirable material for wall building is, however, stone. Every sort of stone that is in the least degree deserving the name of stone has been made use of for the purpose of wall building, from flints, which are some of them as inconvenient in shape for the mason's use as potatoes would be, up to the hardest granite, the finest and truest freestone from our many excellent limestone and sandstone quarries, or the beautiful and precious marbles of Greece and Italy. There are stone walls in Greece and in the Etruscan plain, which have come down to us from remote antiquity, made of large polygonal stones unwrought, or but slightly wrought — and coarsely fitted together without mortar. There are others in Egypt of the finest polished granite with joints so close and true that the edge of a sheet of paper cannot be got between the blocks; but as remarkable in its way as these specimens of consummate handicraft is the construction of the Roman walls, which were often made of small stones, such as we make macadamized roads of, set in a tenacious mortar which has hardened till it is as strong as the stone itself, and steadied at intervals by the introduction of a bond-course of flat bricks or large stones. With this mode of construction, which could be carried out anywhere, the Romans built vast works, the ruins of which remain all over Europe. There is quite as much to learn about stone as about brick; in fact, a great deal more, as, for example, how to select stone, for, owing to the ease with which many sorts of stone are acted upon by the weather, there are many precautions to be taken in the selection or use of material. I will just name the three cardinal ones, which are these: —First, select for use stone from a quarry, and from a bed in that quarry which experience has shown to be durable. Secondly, let that stone lie in the building in the same way as it lay in the quarry, or, as masons would say, bedwise. As an illustration of this you may make an imitation of a wall of books laid flat, and they will do very well; pile the same books on their edges, and they will illustrate in a few minutes what will be, in the course of time, the behavior of blocks of stone that are face-bedded — that is to say, laid the wrong way. Thirdly, and lastly, take such precautions as will insure that no moisture gets into the inside of your wall, or into the heart of the stones that compose it. The materials I have named all of them require to be held together by some sort of cement if the wall is to be durable and weather-tight. Lime is at the bottom of all the cements in general use, and its faculty of hardening after being calcined and slaked, and as it hardens of adhering to the surface of the stones or bricks with which it is in contact, is invaluable. Mortar is made of quicklime and sand. Cements and hydraulic limes are compounds (natural or artificial) of lime and other substances, chiefly alumina, which enables it to set harder, and under water, and more rapidly than in its unmixed state. Plaster of Paris, so serviceable to the French builder, is sulphate of lime, and so on through all the series of cementing agents. In putting walls together great skill is often shown in the bonding or interlacing of the bricks or stones, by means of which they are enabled to hold one another tight; and when big stones are employed, or much difficult masonry occurs, it is, generally speaking, essential for the materials to be cramped and tied together by cramps, dowels, joggles, bond-course, and ties. Before leaving the subject of walls built of bricks or stones and mortar, I ought to say something further as to the fact that from the time of the Romans to our own day very few walls have been homogeneous — that is to say, built of the same materials throughout. This sort of rough masonry of small stones which I referred to just now as much used by the Romans, was not very well adapted to stand the weather and to look handsome; accordingly it was a frequent custom to coat it with a surface of finer stone in larger blocks, as well as to bond it by courses of stones or bricks; and this sort of construction has been, with more or less skill, in use ever since. I need hardly point out that where the heart of a wall is of many rough stones laid with much mortar (a substance more or less compressible), while the face is formed of few well-dressed and squared stones laid with little mortar, there must be great risk of the two parts of the wall behaving differently the one from the other when weight comes upon it. This happened in much of the work of the builders during the 11th and 12th centuries in England — the period of the Norman style. Professor Willis has gone so far as to say that if a Norman tower has not fallen, that circumstance throws great doubts upon its being Norman. Certainly an immense number of them have fallen, and as an example of failure, happily anticipated before there was a fall, I may remind you of Peterborough, where the core of the Norman piers carrying the great central tower has crumbled, and the piers have arched, and have been taken down within the past year. Different from the practice of building composite walls is another which I will only just mention, that of building hollow walls as a protection against damp. We have by no means exhausted the list of materials for walls if only your patience will hold out. A modern material which I will just name, but not dwell on, is concrete, excellent if well looked after, dangerous otherwise; cheap if used in large quantities and where there are few features or irregularities, but far from cheap in small or intricate buildings; very strong, very durable, and sometimes valuable where nature yields few materials for walls of another sort. Timber has been used time out of mind for the walls of houses, and even churches and dignified buildings, in the spots where it is plentiful. There is evidence that timber buildings were in use in Assyria, Egypt, and Lydia, from the curious fact that ancient remains of stone or marble are actually cut into shapes that imitate timber; indeed, the whole system of architectural treatment in use in Greece is a kind of petrifaction of timber construction. The countries of Europe where timber buildings are now mostly to be met with are Sweden, Norway, Russia, and Switzerland. They are in many ways excellent. A timber wall is by no means a bad protection against weather; but it is liable to catch fire, and so quite unfit for use in cities. Many railway stations in England, however, are built of timber, and any one of these will serve to illustrate a cheap way of building timber walls. In Sweden whole logs, halved at the angles, are used, and a wall far more solid, durable and weather-tight can be obtained. The same method is followed in Russia — and you may see a good specimen at the Health Exhibition in the Russian house at the back of the dairies. Timber framing filled in with plastering or with brickwork in the spaces, called usually half-timbered work, is an excellent material for walls if done with the solidity and liberal use of strong timbers that was common in England in the sixteenth and seventeenth centuries. In Lancashire and Cheshire, in Worcestershire and Gloucester, in Kent and Surrey, and in other parts of England you may find many fair half-timbered walls, and even here and there one still lingers in London or the outskirts. We

[1] Portions of a lecture, by Prof. T. Roger Smith, F. R. I. B. A., delivered before the students of University College, and published in the *Building News*.

have in these later days taken to build our walls of glass, as at Sydenham, and of corrugated iron, as in many temporary rooms and churches, and each has its uses. The newest material for wall construction in England (though not, I believe, new in China and Japan) is paper. At the Health Exhibition a very serviceable little cottage walled and roofed with paper may be found. It is known as the Willesden Cottage, and I think I may say from some little experience of it, that the walls are by no means the worst within which I have been sheltered in my lifetime. We will now leave the construction of walls and turn to their treatment as an important factor in architecture. A wall, as we look at it, ought to have three parts: its base, which though below ground ought to be represented by some description of plinth or base-mounting, its body, and its top, which may be a coping to throw off water, or may be the overhanging eaves of the roof which it carries. These, then, are infinitely varied, but they are generally all to be seen in any wall that is architecturally satisfactory to the eye. The different ways of dealing with a wall as an architectural feature may perhaps be grouped as follows: —

I. Emphasizing construction.
II. Masking construction.
III. Varying the outline or plan of the wall.
IV. Enriching the surface of the wall.
V. Color.

These, of course, interlace and exchange, and I adopt a classification not because the things classified are really quite separate, but because it helps us to consider the different sides of the same subject one after another, and to be sure we do not omit something vitally important. Of the methods of emphasizing construction, which is our first division, a very ancient and obvious one is to use large stones. This was a favorite plan with the Egyptians and the Greeks, especially in archaic times. Great stones were used in the Pelasgic walls, large remains of which still exist in Greece and in the Etruscan plain in Italy. These stones were usually polygonal, very carefully fitted together, built up without mortar; such form strong walls, and they impress the spectator very much by the appearance of savage strength which they present. Stones of very large size occur in Greece and in Egypt, and in Syria stones remarkable for their dimensions and for the way in which their outline is marked round with a broad, round mark. Capt. Conder, who has measured many of them, has been kind enough to give me some particulars. He says:

The stones in the Temple wall at Jerusalem are generally 3 feet 4 inches high, with a draft 3 inches wide, and 4 inch deep. The longest stone is 38 feet 9 inches, and there are many 20 feet long. The "master course" is 5 feet high.

The stones in the Hebron Haram are exactly like those at Jerusalem in all respects, including the tooling with a toothed adze driven by a hammer, and bosses and lewis-holes for moving the blocks.

There are four stones of great size at Baalbek — three in the wall and one in the quarry. The latter is the largest. It is 68 feet long. Those in the wall are about 63 feet long and 14 feet high and thick. There is a large amount of masonry at Baalbek about the size of the Jerusalem masonry, and drafted and finished like it. These stones bear Greek letters, apparently masons' marks, and are of the second century A. D. I think myself the larger stones are probably of the same date.

There is another building with great stones in Syria not to be forgotten (see "Heth and Moab," pp. 164–170). It is the palace of Hyrcanus, built about 176 B C. The stones are 7 to 10 feet high, and 20 to 25 feet long, larger than the Jerusalem stones; but they are only 2 feet 3 inches thick, which is peculiar, as there was no backing.

It seems, then, that the Jews used this masonry in the time when they became acquainted with Greek architecture; and I believe drafted masonry is found at Athens in the Acropolis, also of great size, but I know no details. The temples at Thebes have stones quite as large as those in Syria, I understand.

I do not know a single fact to lead us to suppose that the Phœnicians used this kind of drafted masonry, or that Solomon would have used it. I do not think the Jerusalem masonry is older than Herod's time.

Another mode of emphasizing construction, which the Jews seem to have taken a pride in, is the employment of large corner stones. When a wall is built of small or loose materials it is not easy to make the corner strong; in fact, in parts of England the towers, which would otherwise be square, are round, because there is little else but flint to build with, and with flints you cannot make a square corner. It is usual, on account of this tendency to weakness, to fortify the corner by building it of large stones, or better than others; and the Jews seem to have attached some semi-superstitious importance to the top stone at the corner of the building — perhaps a more really appropriate place for a famous stone than our "foundation" stone — which rarely, if ever, is part of the foundation. These stones at the corners came up again in Roman work, and still more frequently in the styles derived from Roman. The famous long and short stones at the corners of Saxon buildings, the well-marked quoins of Gothic ones of all ages, and the carefully wrought rusticated, and raised quoins of Renaissance buildings, all go upon the principle of marking construction. In simple and homely structures, built of materials with a fine surface of good color any method of marking the structure of a wall is successful. In Cumberland and Westmoreland, where many varieties of stone rich in color are met with, the walls of humble churches, or even cottages, are sometimes quite a sight to see and admire from their beautiful and varied tints, especially if a method of walling be adopted which allows the natural cleavage of the stone to be seen without any tooling. Another and an opposite mode of emphasizing treatment, if not construction, consists in exaggerating the squaring and dressing given to stone and bringing it to a surface of the utmost smoothness. In the latter part of the Gothic period, and in much of the Renaissance architecture which followed it, the whole surface is rubbed, and no trace of the tool is left. The same completeness of workmanship was also to be met with in Greece and in Egypt, and wherever we encounter it the spectator seems to be made sensible of the immense pains and care that have been lavished by the builders upon their walls; and to a less extent the same effect is produced by the selection of materials with a fine texture of surface and a good color, like choice bricks. A wall consists of stones and joints, and one way of marking the construction is to make the joints more conspicuous than they naturally would be. We have seen that in ancient Jewish masonry a *draft* or breadth of finely-tooled work surrounds the margin of the stone. In some Greek work we meet with a severe square sinking at the joint, and in Roman work with a more strongly-marked channel. In the revived Roman, which we know as Renaissance, this accentuation of the joints of stone is practised often with great frequency; and the refined mason's work, to which we have given the absurdly inappropriate name of rustication, is one of the sources of the great beauty of many Italian palaces and houses. There are many other ways of emphasizing construction to which I have not time specifically to allude, but may say generally that any treatment of a wall which makes its materials or its construction evident almost invariably adds a natural and, so to speak, a spontaneous grace to buildings. This is nowhere more preceptible than in the half-timbered houses of our country and the entirely timber walls of houses in Switzerland or Sweden. We will now pass to our second group of methods of architectual wall treatment — methods which mask or conceal the construction. The inner face of a wall is almost invariably shrouded in some kind of covering; but even the outer face is as often as not of a nature to conceal the structure. I have already spoken of the custom of *facing* walls, and have pointed out that it may, and often does, render them more fit to resist weather. But for one case in which it is done with this legitimate object you will find scores when it is done for the sake of appearance, and this at every period of the world. There is not one wall in fifty that is built through its entire mass of the same material as on its outside — nay, I have known walls built of homely but durable materials faced with something better looking but not so trustworthy, like a wall of good sound London stock faced with soft porous red or white Suffolk bricks. I am not going to denounce this as a sham,— it used to be very much more the custom to talk about absolute truth in architecture than it now is, and I do not think there is any real sin against good taste in using two materials in one wall, the one fit for the heat and the other fit for the face, if it can be so done as to make a solid structure. Where stone is very scarce, as in London, is very costly, as is the case with the marble used for the outer face of some Italian churches, it has been the custom, and, I suppose, always will be, to use it for the face only. Of course, where this is done it is not infrequently the case that the thin facing is so used as to give the idea of enormous massive blocks, a deceit which I do not advocate or recommend. Another mode of covering the construction up is to case a wall with some description of plaster. This is often structurally of great advantage in keeping out moisture, and if so done as not to imitate stone is no doubt quite legitimate. Many English country churches were built to be plastered, and have been covered with plaster from their origin till the present day, and now find themselves exposed naked to the weather, stripped of their proper garment, all the seams and joints of their original rough masonry brought to view, their quoins sticking up three-quarters of an inch from the general surface, and their appearance not what the original builders intended. Among methods of construction I may just name a curious one, common until lately in Sussex, of building walls of timber framing and then hanging tiles on to them, so shaped and fitted together as to look like brickwork. Many of the apparently brick walls in Hastings, for example, are really only wood-work tiled.

What is a Billion? — In the French system of notation, which is also used in the United States, it is a thousand millions; but the English system gives the name billion to a million millions. Sir Henry Bessemer, the famous inventor, who is in the habit of occupying his leisure with curious calculations for the amusement of his grandchildren, tried to convey some idea of the immensity expressed in this little word. He took it successively as a measure of time, of length and of height. Selecting the second as the unit to be used in his first calculation, he began with the startling assertion that a billion seconds have not yet elapsed since the commencement of the Christian era, nor, indeed a sixteenth part of that number. A billion seconds make 31,687 years, 17 days, 22 hours, 45 minutes, 5 seconds. In regard to length, he chose for his unit the English sovereign, a coin of the size of a half-eagle. A chain of a billion sovereigns would be long enough to pass 736 times around the globe; or, supposing all these coins lay side by side, each in contact with its neighbor, it would form about the earth a golden zone 26 feet 6 inches wide. This same chain, were it stretched out straight, would make a line a fraction over 18,328,445 miles in extent. For measuring height, Sir Henry chose for a unit a single sheet of such paper as that upon which the London *Times* is printed, a measure of about one three hundred and thirty-third of an inch in thickness. A billion of these thin sheets, pressed out flat and piled vertically upon each other, would attain the altitude of 47,348 miles. — *Engineering News.*

CAST-IRON IN BUILDINGS.

IF any building material can be said to have fallen under a cloud it is cast-iron. Unless in the form of columns and stanchions it is seldom used, or only when no material can be substituted. Cast-iron is supposed to be treacherous, uncertain, incapable of sustaining tensile strains, liable to flaws, which are concealed from all eyes, and equally puzzling to operators in the blast furnace and the foundry. How many of its defects arise from imagination may not at first sight be apparent. Constructive science is not without its prejudices, and a good many of them surround cast-iron. Why that material should be slighted is easily explained. At the time when exceptionally large railway bridges were projected, a Royal Commission was appointed to inquire into the use of cast-iron and wrought-iron for the purpose. The risks arising from the vibration of cast-iron caused by the constant passing of trains, and from the occasional derailment of a locomotive or a line of carriages, were considered, and it was supposed that cast-iron in those contingencies was less suitable than wrought-iron. The Britannia Bridge, on the other hand, made it plain that an immense structure could be constructed of plates and angle-irons with as much ease as a house was built of bricks, and of a strength that was equal to every reasonable test. The engineers of that bridge, Stephenson, Fairbairn, Hodgkinson, and Clark, became, as it were, the lawgivers on iron construction, and as they were supposed to be in favor of wrought-iron exclusively, it was made the favored material. A little inquiry would have shown that Stephenson, who was the chief among them, had no partialities. If he used wrought-iron to cross the Menai Straits, in a no less remarkable work, the High-Level Bridge at Newcastle-on-Tyne, he gave the preference to cast-iron. Fairbairn, however, found it more convenient to undertake contracts for wrought-iron girders, and, as he was a rather productive writer, his literary influence was widespread, and was employed in advocacy of the material. Wrought-iron was also supposed to offer more facility for designing new types of bridges, and in consequence a great many engineers were attracted by it. During the last thirty years very few cast-iron bridges of any importance have been erected in England, while the varieties of those in wrought-iron are almost countless.

Fairbairn was better known as a practical engineer in connection with mills than with railways, and as soon as, by a piece of sharp practice, he had patented a rivetted girder, he was able to introduce a great many of them into buildings. About the same time another influence came into operation against cast-iron. In 1846, the carpenters of Paris organized a general strike, and architects and builders were in consequence compelled to substitute iron for wood in floors and roofs. Various sections of rolled girders were tried, and eventually the I-girder was evolved. The employment of one with a bearing of 18 feet in a house in the Boulevard des Filles du Calvaire, in Paris, about 1849, was among the most memorable events in the history of modern building construction, and cast-iron beams were henceforth superseded. They had been in use from 1801, when Boulton & Watt arranged the iron-work for Phillips & Lee's mill in Manchester.

There is no denying the convenience and advantages of wrought-iron, whether in the form of rolled joists or rivetted girders. But let us be just to beams in the other material. When cast-iron lost its position little was alleged about deficient strength or liability to collapse through invisible flaws. The experiments on it produced remarkable results. Thus, for example, it was ascertained by the Royal Commission on the Application of Iron to Railway Structures that when cast-iron bars were exposed to successive transverse blows, each blow producing one-third of the ultimate deflection (or deflection immediately before breaking), they bore four thousand such blows without having their strength impaired. It was likewise found that when bars of cast-iron were exposed to successive deflections by means of a revolving cam, they bore one hundred thousand such deflections without any impairment of strength. These figures show that cast-iron does not so readily succumb even under variable loads which are frequently applied and removed.

The bridges which were constructed in days when wrought-iron was not recognized as a building material are also evidence of the endurance of cast-iron. The Coalbrookdale Bridge over the Severn, designed by Abraham Derby, was constructed in 1777. Telford's Bridge, near it, at Buildwas, was finished about twenty years afterwards, and his Waterloo Bridge at Bettws-y-Coed in 1815. The big Sunderland Bridge, 236 feet span, dates from 1796, and bids fair to last long, although it is only the work of an amateur engineer. It was designed by the rebellious staymaker, Tom Paine, and was originally put together at the Yorkshire Stingo in Lisson Grove. Southwark Bridge has sustained the wear and tear of metropolitan traffic from 1819. All those bridges are in positions which are exceptionally trying, and their existence is a refutation of the suspicions which some people have entertained respecting the strength of cast-iron. If the material can withstand the variety of loads which pass over Southwark Bridge, and all variations of atmospheric condition, there need be no fear about its security within a building.

With such precedents, the Corporation of Middlesbrough may have full confidence in the fitness of cast-iron to support the floor of their great hall, no matter how crowded it may be. Nevertheless a good deal of credit is to be given to Mr. Hoskins for the experiment, which has been so well carried out by Messrs. Dennett & Ingle. It would have been possible to have used wrought-iron beams for the purpose, but apart from questions of expense and headway, the appearance of the room must have been very different. Experience has shown that it is almost impossible to give an architectural character to rivetted or rolled girders. The utmost that can be done is to decorate them with painted ornament, or to perforate the web-plate with patterns. But cast-iron is more tractable and lends itself to design. There is of course a risk that it can be made into forms which are more applicable to wood or stone, but in good hands there need be no want of fitness in the ornamentation. The material has been so little used, it is not surprising that occasionally there should be a doubt about the artistic treatment that is most appropriate to it. The late Owen Jones did a good deal towards the creation of a style that was adapted to cast-iron. He seemed to keep in view the crystalline nature of the material as a fundamental idea, and to have restricted himself to geometrical patterns which would be in keeping with extreme rigidity and power to resist compression. On the other hand, there are structures of cast-iron, which are so profusely ornamented with imitations of carving as to suggest only the ease with which the metal can be melted and run into moulds. The spandrels of railway bridges might be cited as examples which show that more was thought of the flowing curves of the "filling in" than of lines which might express construction.

It is not to be inferred from what we have said that we propose a substitution of cast for wrought-iron in buildings. All we venture to imply is that both kinds of girders have their uses, and that by restricting himself to horizontal beams in wrought-iron, the architect very often adds to his difficulties in his endeavors to produce effect; while cases often arise like the Middlesbrough Town Hall, where cast-iron demands a preference before all other materials. — *The Architect.*

THE WESTERN ASSOCIATION OF ARCHITECTS.

CONSTITUTION.

SECTION I. The name of this organization shall be the WESTERN ASSOCIATION OF ARCHITECTS.

SEC. II. The objects of the Association are: To unite in fellowship the architects of the United States, to combine their efforts so as to promote the artistic, scientific and practical efficiency of the profession, and to cultivate and encourage the study of kindred arts.

SEC. III. This Association shall consist of Fellows and Honorary Members.

SEC. IV. Any architect practising his profession in the United States may become a Fellow of this Association. All members in good standing in any State Association organized under the laws of that State, also all members of the American Institute of Architects who shall become subject to the constitution of the Western Association are by virtue of such membership Fellows of this Association.

SEC. V. The officers of this Association shall be a president, a secretary, a treasurer, and as many vice-presidents as there shall be State associations, the president of each State association being a vice-president of this Association.

SEC. VI. It shall be the duty of the President to preside at all meetings of the Association, but in his absence the Vice-President of the association of the State in which the meeting of this Association shall be held shall preside.

It shall be the duty of the Secretary to take the minutes of the meetings, and conduct the correspondence of the Association, subject to the Board of Directors.

It shall be the duty of the Treasurer to collect all funds, and disburse the same on the order of the Secretary, when countersigned by the Chairman of the Board of Directors.

SEC. VII. This constitution may be mended by a two-thirds vote of the Fellows present at any regular meeting.

BY-LAWS.

ARTICLE I. The annual meetings of this Association shall be held upon the third Wednesday in November, and at such place as shall be designated by a majority vote of members present at the previous meeting.

ART. II. The meetings of this Association shall be conducted in accordance with "Robert's Rules of Order."

ART. III. The Board of Directors shall consist of five Fellows, who shall have the care of the property, and management of the general welfare of this Association, and shall report at such regular meeting.

ART. IV. With the exception of Vice Presidents, all Officers including Directors shall be elected annually by a majority ballot-vote at an annual meeting of this Association.

ART. V. All papers, books, and other records shall at all times be open to the inspection of the Fellows of this Association.

ART. VI. Candidates for membership as Fellows of this Association shall pay an initiation fee of five dollars, excepting members of State Associations or of the American Institute of Architects, who shall be admitted free.

ART. VII. All Fellows of this Association shall pay an annual due of two dollars.

Art. VIII. All applicants for membership as Fellows of this Association shall be referred to the Board of Directors, who shall investigate their standing, and if found worthy, recommend them for election at the next meeting.

Art. IX. Twenty Fellows shall constitute a quorum for the transaction of business.

Art. X. The By-Laws of this Association can be amended at any meeting by a vote of two-thirds of the Fellows present.

OUR STABLE COMPETITION.

Baltimore, Md.

To the Editors of the American Architect: —

Dear Sirs, — As ynu do not mention what you wish the drawings to be finished in; will you kindly inform me if color will be allowed, or whether they must be finished entirely in India ink?

Yours truly, Architect.

[Drawings are to be rendered in pen-and-ink. —Eds. American Architect.]

LEARNING WITHOUT TEACHERS.

Kansas City, Mo., November 18, 1884.

To the Editors of the American Architect: —

Gentlemen,— Please inform me through your valuable journal, if a student can learn the orders of architecture, so that he can apply them to buildings, without the aid of an instructor; if so, please name an English book that treats best on the subject; I have a book, but it gives no details, and I cannot see how I can practise the orders, especially the capitals, without details. Also please state the best book that treats on sketching for a student?

By answering the questions, you will oblige

Frank Maurice.

[" *Nicholson's Cyclopædia of Architecture*," " *Gwilt's Cyclopædia of Architecture*," " *The Architectural Director*," " *Batty Langley's Builder's Treasury*," " *Chambers' Civil Architecture*," " *Nicholson's Students' Instructor*," " *Nicholson's Treatise on the Five Orders*," and several other books, give details of the orders. Nicholson's books are perhaps the best of the cheaper ones. To learn sketching without a teacher, get " *Ruskin's Elements of Drawings*," practise faithfully all the exercises in it, and then sketch from nature as much as possible, copying a plate in one of the architectural journals occasionally, to get ideas of rendering forms and textures. — Eds. American Architect.

AN ARCHITECT'S CHARGE QUESTIONED.

November 3, 1884.

To the Editors of the American Architect: —

Dear Sirs, — I desire to submit for your opinion the following case.

A club in this city decided last year to build a house for its occupation. In the ranks of the club was an architect. This architect submitted plans for the approval of the club. The club finally appointed a committee to take entire charge of the erection of the building (including the acceptance of suitable plans).

At the outset this committee was informed by the above-named architect, that no charge would be made for his services.

At the first meeting of this committee, the plans came up for approval, and some radical changes were suggested, to which the architect replied, that the change of plan suggested would put him to considerable trouble and expense, and the fact that the architect was to make no charge for his services, had its influence in inducing the committee to waive their views regarding the change suggested, and the plans as presented were adopted.

The building has been erected on the original plans presented, and it now transpires that the adoption of the change suggested at the first meeting of the committee would have been greatly to the advantage of the club.

Six months after the completion of the building, the architect presents a bill for "incidentals" (no charge being made for services), for over two and three-quarters per cent on the entire cost of the building. This bill is a complete surprise to each member of the Building Committee, as well as to every member of the club.

Will you kindly inform me what you consider the rights and duties of the club in the premises?

There is no one in the club versed in the matter of building, but it does seem to me that the architect having informed the committee that he should make no charge for his services, and the committee understanding that this meant no charge of any kind, and his assertion that a change of plan would put him to considerable expense and trouble, would seem to indicate that at that time he did not intend to make any charge of any kind; and further his presenting no bill until six months after the occupation of the building, would tend to confirm the view I take, that when he proposed to make no charge for his services, he did intend to convey the impression of no charge of any kind. Respectfully yours,

Enquirer.

[We think there must have been some misunderstanding as to the architect's intention. It is hardly possible that a professional man should have intended to present his club with the whole time, responsibility and money required for designing and supervising the erection of a club-house. Even if an inexperienced and over-generous member should have done so, however, it would be, we should say, quite inconsistent with the spirit which should rule in clubs of gentlemen to take him at his word, and exact from him the literal fulfilment of his rash offer, if it involved, as it certainly would, labor and expenditure on his part which he could not have foreseen. Our advice to the club would be to pay the architect his two and three-quarters per cent, and to be thankful that it contained a member so liberal as to make a contribution to the new building of the remaining two and one-quarter per cent. — Eds. American Architect.]

NOTES AND CLIPPINGS.

The First Maker of Plate-Glass.—Plate-glass was discovered in an accidental way, in 1688, by a man named Thevart. It is attributed to the breaking of a vessel containing melted glass, a portion of which found its way under a large flag-stone, which, when subsequently removed, was found to cover a plate of glass. This suggested the idea of casting glass in plates.—*Philadelphia Bulletin.*

Heavy Chains.—Two heavy chains of the following dimensions, for use on the large floating bridge connecting Portsmouth and Gossport, have recently been made in England: each chain was 640 yards in length, consisting of nearly 5,000 links, the diameter of iron being 1 11-16 inches, and the weight of each chain 21 tons, tested to a tensile strain of 40 tons, or twenty per cent over Admiralty test, the actual breaking strain being proved to be 70 1-2 tons. Each chain was loaded upon a carriage weighing eleven tons, the load for road transit being 32 tons.—*Iron Age.*

Assyrian Excavations. — Sir Henry Layard has recently repeated his statement that Botta discovered the first Assyrian monument (at Khorsabad), but says that Botta did not excavate in the mound of Kouyunjik, which is now considered to mark the site of Nineveh, from the discovery there of the ruins of the palace of Sennacherib. "I went to Mosul in the early spring of 1840, and visited the ruins which were then supposed to mark the site of Nineveh. Even then the idea of excavating occurred to me. After spending nearly two years in the Bakhtiyari Mountains, with the object of discovering Assyrian remains and cuneiform inscriptions, I returned to Mosul in 1842. Botta had then just arrived there as French consul. I urged him to excavate, and visited with him the mounds on the banks of the Tigris. I specially urged him to try that of Nimroud." These statements have been called out by remarks of Professor Max Müller, in his latest volume, which have the effect of depreciating the services of Layard, H. C. Rawlinson and other Englishmen. The latter calls attention, in the *Athenæum*, to the explorations, measurements and charts made by British Resident Rich, of Bagdad, prior to 1820, and refers Professor Müller to Rich's "*Residence in Kurdistan and on the Site of Ancient Nineveh*," London, 1836. Sir Henry Rawlinson also defends himself from the disparaging remarks of the famous Sanskrit scholar, and points to his long residence in Bagdad, "in exile," for the purpose of solving the mysteries of cuneiform, his earlier services in that cause, his gallant conduct in obtaining the almost inaccessible Behistun inscriptions, so important to the decipherment of the arrow-headed character, and incidentally charges Professor Müller with many omissions of credit to himself and other workers in this field. — *Exchange.*

Roofing of the Royal Exchange.— The roofing of the Royal Exchange, London, envolved engineering features which make it of more than passing interest. The inclosure covered is about fifty-eight feet in width and one hundred and sixteen feet in length. The roof is in accordance with the style of the building, and was designed with the idea that any roof to be added over the open area should be not a mere glass cover, but of a character consistent with the architecture of the court, such that it might have been designed by the architect of the building, the late Mr. Tite, as a great saloon, had he been so instructed originally. The design of the roof is symmetrical, applicable only to the particular building. The ceiling is composed of glass coffers, glazed in prismatic form, with the tops hinged so that the inside can be cleaned from the outside. In the centre of the roof is a dome, forty feet in diameter, around which are louvres for ventilation. Access for cleaning, removing snow, etc., from every part of the outside of the roof has been provided, with complete safety to the workman, by means of steps on each main rib, by a platform or gallery around the outside of the dome, and another around the lantern-light. For the principals a box-section has been adopted, as being peculiarly suitable for resisting the strains to which the roof is subjected. They are arched in form, with a total rise of seventeen feet. There are eight principals or ribs, six of which span the coutr-yard, fifty-eight feet in width, and the two central ones carry the dome or cupola. Trussed principals in such a situation have been considered inadmissible, and they are therefore made without tie-beams, to prevent them thrusting out the walls. Neither are there buttresses behind the walls to resist the thrust of an arch. Under these peculiar conditions the principals, although arched in shape, are designed to act as girders, with a vertical or downward pressure upon the walls. The latter, being only two feet thick, would resist but little horizontal or outward thrust. The strains in the girders do not exceed five and three-fourths tons per square inch in tension, and four and three-fourths tons in compression. For calculation, the maximum horizontal pressure of the wind has been assumed to be half a hundredweight per square foot of vertical surface opposed to it in roof and dome, coming from any quarter. The greatest strains are in the two girders carrying the dome, and one of these has been tested with loads equal to all the weights and pressures that can possibly come upon it, in order to ascertain if there would be any danger of its thrusting out the walls. The feet rested on iron plates and spread apart with the loads already mentioned one-half inch, and this was due in a great measure to the two halves of the girder having been fastened together with service-bolts. The result of this experiment is considered satisfactory. All the wrought-iron arched-roof principals were lifted into position by means of an upright timber or derrick, ninety-five feet high and sixteen inches square, properly guyed, from which the girders were suspended by their middle with a rope a little over two inches in diameter. Additional strength was given to the derrick by a system of trussing with twisted strand wire and short wooden struts, to prevent flexure. The tackle consisted of upper and lower blocks, each containing three sheaves, which made six parts to the rope. The first girder erected weighed, with its attachments, nine tons. Besides the tackle mentioned, a double-purchase crab was used, and a separate snatch-block at the foot of the derrick.— *The Metal-Worker.*

GELATINE EDITION.

During the year 1885 a series of Gelatine Prints, (Heliotypes) photographed from the natural object, will be published in the AMERICAN ARCHITECT AND BUILDING NEWS.

These gelatine prints will be issued once a month to those subscribers only who will pay a dollar extra for the twelve prints.

SUBSCRIPTION PRICES.

[IN ADVANCE.]

REGULAR EDITION:—$6.00 per year; $3.50 per half year.

GELATINE EDITION (the same as the regular edition, but including 12 Gelatine Prints):—$7.00 per year; $4.00 per half year.

MONTHLY EDITION (identical with the first weekly issue for each month, contains no Gelatine Prints,):—$1.75 per year; $1.00 per half year.

BUILDING INTELLIGENCE.

(Reported for The American Architect and Building News.)

[Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.]

BUILDING PATENTS.

[Printed specifications of any patents here mentioned, together with full detail illustrations, may be obtained of the Commissioner of Patents, at Washington, for twenty-five cents.]

308,337. Spring-Hinge. — James H. Alexander, Philadelphia, Pa.

308,340-341. Hoisting-Machine.—James Boyd, St. Paul, Minn.

308,358. Water-Closet. — Frank B. Hanson, New York, N. Y.

308,391. Brick-Kiln. — John Weaver, East Liverpool, O.

308,402. Cork Strip for protecting Steam and Gas Pipes, etc. — Jules Bourdon, Paris, France.

308,426. Levelling-Instrument. — William H. Munford, Anna, O.

308,428. Hot-Air Furnace. — John B. Oldershaw, Baltimore, Md.

308,443.—Window-Bead Fastener.—Ezra W. Talbot, Napoleon, O.

308,444. Fire-Escape. — Augustus H. Terwilliger, Newburg, N. Y.

308,454. Stone-Drill. — Thomas M. Yerkes, San Francisco, Cal.

308,465. Fireplace. — Edwin Chickering, Cedar Rapids, Iowa.

308,486. Derrick.—Thos. Gaffney, Detroit, Mich.

308,517. Fastener for Meeting-Rails of Sashes.—John A. Paine, Tarrytown, N. Y.

308,535. Easel.—Thomas C. Vail, Topeka, Kans.

308,537. Spring-Hinge.—Patrick H. Walsh, Waterbury, Conn.

308,540. Compound Faucet. — Charles H. Waters, Chicago, Ill.

308,559. Combined Lock and Latch.—Horace L. Heaton, Indianapolis, Ind.

308,561. Wrench.—John Houlehan, Toledo, O.

308,574. Shingle Gauge.—Samuel T. Poe, Covington, Ky.

SUMMARY OF THE WEEK.

Baltimore.

Building Permits. — Since our last report eleven permits have been granted, the more important of which are the following: —

Adam Horn, three-st'y brick building, e s Eden St., n of Bank St.

Chas. Dimling, 3 two-st'y brick buildings, e s of alley, w of Burke, and s of Monument St.

Charles Fisher, two-st'y brick building, in rear n w cor. Patterson Park Ave. and Jefferson St.

The labor quotations for December remain as quoted.

Boston.

The Public Library. — At the meeting of the Common Council, November 28, the order passed last week for the appointment of a committee to award the prizes for the Public Library plans, though it had been specially assigned for reconsideration, did not come up.

Building Permits. — *Gray St., No.* 18, Ward 17, for Jas. G. Smith, brick apartment-house, 34′ x 50′ 9″, flat; J. H. Coon & Co., builders.

Ruggles St., Nos. 101 *and* 103, Ward 17, for T. Connolly, brick tenement, 34′ x 37′, flat; T. Connolly, builder.

Shawmut Ave., No. 25, Ward 12, for G. R. White, brick store, 16′ x 25′, flat; J. H. De Leue, builder.

West Fourth St., No. 71, Ward 13, for J. Cavanagh, brick dwell. and office, 20′ x 41′, flat; J. Cavanagh, builder.

Clifton St., near Cottage St., Ward 20, for A. P. Clifford, wooden dwell., 14′ x 18′ 6″ and 27′ x 50′, pitch; A. P. Clifford, builder.

East Ninth St., No. 906, Ward 14, for Lyman Locke, wooden storage, 22′ x 50′, flat; A. P. Clifford, builder.

Longwood Ave., near Batchelder St., Ward 20, for Mrs. Annie Riley, 2 wooden dwells., 14′ x 14′ and 20′ x 29′, pitch; Peter Riley, builder.

Chaucer St., near Moore St., Ward 1, for J. G. Morton, wooden dwell., 18′ 6″ x 26′, pitch; J. G. Morton, builder.

Fairview St., near Skinner St., Ward 23, for Jno. D. Noyes, 21′ 6″ x 3.′, pitch; Swanson & Murray, builders.

Brooklyn.

Building Permits.—*Norman Ave.*, n e cor. Diamond St., 4 three-st'y frame tenements, felt, cement and gravel roofs; cost, each, $3,800; owner, architect and carpenter, David Atkin, 551 Lorimer St.; masons, Gately & Smith.

Graham Ave., No. 18, e s, 75′ s Debevoise St., four-st'y brick store and tenement, tin roof; cost, $7,000; owner, John Schultheiss, 16 Graham Ave.; architect, Th. Engelhardt; builder, John Auer.

Ellery St., Nos. 314 *and* 316, s s, 275′ e Broadway, 2 three-st'y frame dwells. and sash-maker's shops, tin roofs; cost, each, $3,000; owner, Michael Mayer, on premises; architect, Th. Engelhardt.

Elm St., No. 41, n s, 100′ w Bushwick Ave., three-st'y frame dwell., tin roof; cost, $3,500; owner, Mrs. M. Uhrig, Hudson, N. Y.; architect, Th. Engelhardt.

Marion St., n s, 150′ e Reid Ave., 3 three-st'y brick dwells., tin or felt and gravel roofs; cost, each, $3,000; owner, Mrs. E. Sullivan, Patchen Ave., near Decatur St.; architect, M. Walsh; builder, Philip Sullivan.

Twelfth St., s s, 80′ w Sixth Ave., three-st'y brick dwell., tin roof; cost, $4,000; owner, Edwin C. Squance, 238 Eleventh St.

Warren St., n s, 232′ 2″ e Fourth Ave., 3 four-st'y brick tenements, felt and gravel roofs; cost, $7,000; owner Geo. R. Brown, 34 South Portland Ave.; architect, C. E. Cozzens; builder, L. E. Brown.

Bushwick Ave., s e cor. Palmetto St., three-st'y brick tenement, tin roof, cost, $5,500; owners, Blaisdell Bros., 890 Bushwick Ave.; architect, Th. Engelhardt.

Twenty-second St., n s, 175′ e Third Ave., 4 two-st'y and basement frame dwells., tin roofs; cost for the four, $8,200; owner, Mary A. Drury, 195 Adams St.; architect, Samuel Bennett; builder, John Starbier.

Gates Ave., n s, 200′ w Tompkins Ave., 5 four-st'y brick stores and flats, tin roofs; cost, each, $10,000; owner, W. H. Aldridge, on premises; architect, Robt. Dixon; builder, James Burns.

Eagle St., No. 156, s s, 125′ e Manhattan Ave., three-st'y frame store and tenement, felt and gravel roof; cost $4,000; owner, John P. Wierk, 154 Eagle St.; architect and carpenter, John D. Eggers; mason, John Hafford.

Lexington Ave., n s, 100′ e Patchen Ave., three-st'y brick express stables, tin roof; cost, $4,800; owner, Smith Cox, 57 Patchen Ave.; architect, J. D. Reynolds.

Manhattan Ave., n e cor. Clay St., three-st'y brick store and tenement, tin roof; cost, $6,500; owner, Peter McKeever, 75 Clay St.; architect, J. Mulhaul; builders, J. Rooney and J. Zallon.

Chauncey St., n s, 375′ e Patchen Ave., 3 three-st'y frame tenements, tin roofs; cost, each, $4,000; owner, architect and builder, Joseph Smyth, 255 Chauncey St.

Third Ave., e s, 42′ s Twenty-sixth St., 2 three-st'y brick stores and dwells., tin roofs; cost, each, $3,500; owner, Thomas Pitbladdo, 213 Seventeenth St.; architect, B. S. Brown; builders, Wm. and Thos. Corrigan.

Sumner Ave., No. 144, n w cor. Pulaski St., three-st'y brick and brown-stone store and dwell., tin roof; cost, $7,500; owners and carpenters, Wm. and Walter Wyetts; architect, W. F. Clayton; mason, R. Wyetts.

Sumner Ave., w s, 20′ n Pulaski St., 3 two-st'y brick and brown-stone dwells., tin roofs; also, *Pulaski St.*, n s, 82′ w Sumner Ave., two-st'y brick and brown-stone dwells., tin roofs; cost, each, $5,500; owners and carpenters, William and Walter Wyetts; architect, W. F. Clayton; mason, R. Wyetts.

Hicks St., w s, 125′ s Clark St., 2 four-st'y brick dwells., Sparham fire-proof cement, etc., and terra-cotta; cost, about $20,000 each; owner, John W. Mason, 79 Remsen St.; architect, W. W. Morris; masons, J. Stevenson & Son; carpenters, Morris & Selover.

Chicago.

Building Permits. — J. Whasononsky, two-st'y dwell., 258 North Sangamon St.; cost, $2,500; builder, M. Lukowski.

S. O. Moore & E. A. Wariner, 2 two-st'y dwells., 3231 and 3245 Groveland Park Ave.; cost, $15,000; architect, S. H. Schock.

W. Walsh, two-st'y dwell., 3131 Wabash Ave.; cost, $7,000; architects, Fromann & Gebson; builder, H. Appel.

F. Gorke, three-st'y store and dwell., 660 Blue Island Ave.; cost, $7,000; builder, C. Baumann.

G. B. Cornell, 2 two-st'y dwells., 334-336 Park Ave.; cost, $8,000; architect, C. L. Stiles; builder, O'Connell.

Chicago, Milwaukee & St. Paul Railroad, ice-house, California Ave.; cost, $3,500.

J. Dillenburg, three-st'y store and dwell., 477 Halsted St.; cost, $6,000; builders, Field & Shay.

Duffy & Guffin, 2 two-st'y dwells., 3705-3707 Prairie Ave.; cost, $6,000; architect, Van Pelt.

Mrs. C. Bosheiman, two-st'y dwell., 623 Loomis St.; cost, $2,500; builder, F. Leman.

L. Kohl, two-st'y dwell., 420 West Randolph St.; cost, $8,000; architect, H. Seiks; builders, C. Agnew & Son.

J. Lastowska, cottage, 604 West Seventeenth St.; cost, $3,000; builder, J. Ronta.

E. J. Lehmann, 2 two-st'y dwells., 885-887 North Clark St.; cost, $3,000; builders, Bodner Bro.

C. W. Pardridge, 5 two-st'y dwells., 3712-3720 Ellis Ave.; cost, $15,000.

C. Enders, three-st'y store and dwell., 31 Chicago Ave.; cost, $7,000; architect, Kehwoldt.

T. Harvy, two-st'y dwell., 264 Tremont St.; cost, $4,500; architect, T. Karls.

J. Waugelin, two-st'y flats, 50 Burling St.; cost, $3,200; builder, A. Baumann.

T. M. Pope, two-st'y dwell., 759 Ashland Ave.; cost, $3,500; builder, E. H. Bessa.

Heidman, two-st'y dwell., 148 Burling St.; cost, $4,000.

Cincinnati.

Building Permits. — H. W. Scarborough & Sons, addition to two st'y brick building, cor. Fifth Ave. and Main St.; cost, $5,000.

Mrs. C. Pope, two-st'y frame building, Court St., between Hatch and Pavilion Sts.; cost, $2,700.

Henry Thumm, three-st'y brick building, cor. Vine and Molitor Sts.; cost, $4,000.

W. S. Ralphey, two-st'y frame building, Chapel St., near Willow St., Walnut Hills; cost, $2,000.

Wm. Hickey, two-st'y frame building, cor. Lane and Locust Sts.; cost, $3,000.

Henry Eldering, two-st'y brick building, 598 Sycamore St.; cost, $3,000.

Repairs and additions; cost, $4,210.

Total number of permits, 716.

Total amount to date, $2,744,703.

New York.

Armories.— The Armory Commission, at their meeting on December 1, decided to accept the plans of Mr. Henry F. Kilburn for the Twenty-second Regiment armory, and of Mr. J. R. Thomas for that of the Eighth Regiment.

House.— For Mr. Joseph F. Kittel a three-st'y brick and terra-cotta house is to be built on the e s of Riverside Drive, 50′ n of One Hundred and Twenty-second St., from plans of Mr. A. B. Jennings.

Building Permits. — *Tinton Ave.*, s e cor. One Hundred and Sixty-third St., 9 frame dwells., and corner building for store; cost, 8 each, $1,800, and 1, $2,800; owner and builder, John W. Decker, 841 Forest Ave.; architect, W. W. Gardiner.

One Hundred and Twenty-ninth St., s s, 200′ e Eighth Ave., five-st'y brown-stone front tenement, tin roof; owner, John H. Provost, 426 East One Hundred and Nineteenth St.; architect, Andrew Spence.

Seventy-fifth St., s s, 200′ w of Boulevard, 5 three-st'y brown-stone front dwells., tin roofs; cost, each, $12,000; owner, Daniel D. Brandt, 38 Bank St.; architect and builder, Wm. J. Merritt, 113 West One Hundred and Twenty-eighth St.

Seventy-fifth St., n s, 200′ w of Boulevard, 4 five-st'y brick flats, tin roofs; cost, each, $20,000; owner, architect and builder, same as last.

East Broadway, No. 38, five-st'y brick tenement and store, tin roof; cost, $14,000; owner, Esther Simon, 38 East Broadway; architect, Wm. Graul.

West Fifty-sixth St., Nos. 539 *and* 541, four-st'y brick factory, gravel roof; cost, $30,000; owner, H. H. Hollis, 471 West Fifty-seventh St.; builder, Stephen H. Mapes.

One Hundred and Fifty-sixth St., n s, 100′ e Tenth Ave., two-and-a-half-st'y frame dwell., shingle roof; cost, $3,000; owners, H. P. Steers and wife, Tenth Ave. and One Hundred and Fifty-sixth St.; architect, Henry Foucheaux.

Fifty-fifth St., s s, 225′ e Eleventh Ave., 5 four-st'y brick tenements, tin roofs; cost, each, $18,000; owner, Chas. H. Bliss, Grand Union Hotel; architects, Thom & Wilson.

White St., Nos. 115, 117, 119 *and* 121, s e cor. of Centre St., seven-st'y brick factory and stores, tin roof; cost, $75,000; owner, Hanan & Son; architects, Babb, Cook & Willard.

Sixtieth St., n s, 150′ w Tenth Ave., five-st'y brick flat, tin roof; owner, Chas. Kopp, 223 West One Hundred and Thirty-third St.; architect, Chas. Baxter.

One Hundred and Seventh St., n s, 150′ w Avenue A, two-st'y brick office and stable, asphalt roof; cost, $5,000; owner, Geo. A. Reeber, 222 West Thirtieth St.; architect, Chas. Baxter.

Sixty-second St., s s, 100′ e Eleventh Axe., 24 five-st'y brick flats (2 with stores), tin roofs; cost, each, $18,000; owner, Gotthold Hang, 1766 Third Ave.; architect, Geo. W. Spitzer.

Ninth Ave., w s, Sixty-first and Sixty-second Sts., one part one and part three-st'y brick armory (12th Regiment), tin roof; cost, $300,000; owner, City of New York, Gen. Alen Shaler, sect'y Armory Board, 9 West Forty-fifth St.; architect, Jas. E. Ware.

One Hundred and Thirty-fourth St., s w cor. Alexander Ave., two-st'y brick lumber storage and carpenter shop, tin roof; cost, $20,000; owner, New York Wood Turning Co.. One Hundred and Thirty-fourth St., bet. Lincoln and Alexander Aves.; architect, C. C. Peck.

East One Hundred and Twentieth St., No. 227, four-st'y brick stable and warehouse, tin roof; cost, $——; owner, Richard Weber, 211 East One Hundred St.; architects, Jas. S. Wightman.

Alterations.—*West Fourteenth St., No.* 313, internal alterations, partitions, light shaft, chimney, etc., fit up for flats; cost, $5,000; owner, Henry B. Havemeyer, New Windsor, N. Y.; architect, John Sexton; builder, E. H. Miller.

East Sixteenth St., No. 112, bay window and extension on rear second and third stories; cost, $5,000; owner, Auguste Lewis, 74 Union Pl.; architects, Vaux & Radford; builders, D. C. Weeks & Son and Henry Ellis.

West Fifty-eighth St., No. 223, four-st'y brick extension, tin roof; cost, $20,000; owner, Chas. E. Appleby, 216 West Fifty-ninth St.; architect, C. Abbott French; builder, M. McDermot.

Bowery, Nos. 17 *and* 19, raise one-st'y and repair damage by fire, new iron front; cost, $4,000; owner, Marcus Kohner, 147 East Fifty-sixth St.; architect, Bart Walther.

Fifth Ave., No. 80, is to be altered into a six-st'y building, the first floor for store purposes, and above studios and offices. Mr. Geo. Hiller, the owner, will expend about $50,000 on the improvement.

Philadelphia.

Building Permits.—*Reese St.*, bet. Cumberland and Huntingdon Sts., one-st'y building, 20′ x 60′; George Kressler, contractor.

Eleventh St., cor. Indiana Ave., 2 two-st'y dwells., 16′ x 34′; J. R. Pyle, owner.

Thirteenth St., bet. Jackson St. and Snyder Ave., one-st'y blacksmith shop, 30′ x 50′; Wm. C. McPherson, contractor.

Haverford Ave., between Thirty-sixth and Thirty-seventh Sts., 2 two-st'y dwells., 15′ 6″ x 46′; Chas. F. Hall, owner.

Wilson St., s of York St., two-st'y dwell., 16′ x 28′; Caffrey & Alexander, contractors.

Nickel St., below Venango St., 2 three-st'y dwells., 14′ x 30′; John Rodel, owner.

Sixtieth St., bet. Greenway St. and Kingsessing Ave., two-st'y dwell., 34′ x 43′; Robert H. Parker, contractor.

Lancaster Ave., bet. Thirty-fourth and Thirty-fifth Sts., two-st'y stable, 34′ x 40′; Jno. G. Ruff, contractor.

Sixteenth St., s of Master St., 4 three-st'y dwells., 15′ 9″ x 40′; B. Ketchum & Son, contractors.

Orkney St., bet. Indiana and Columbia Aves., 11 two-st'y dwells., 14′ x 30′; Thos. L. Kells, owner.

Thirty-third St., cor. Thompson St., ice-house, 37′ x 47′; John Brainer, contractor.

Marshall St., No. 2304, two-st'y dwell., 16′ x 44′; Jas. P. Yerkes, owner.

Frankford Road, No. 1754, two-st'y stable, 18′ x 30′; Jas. McCaully & Son, contractors.

Howard St., between Columbia and Montgomery Aves., office and dwell., 25′ x 44′; Engelbert Schmidt, contractor.

Cabot St., No. 1610, two-st'y addition to stable, 14′ x 28′; Geo. Moore, contractor.

PUBLISHERS' DEPARTMENT.

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BUILDING INTELLIGENCE.

Fourth St., e s, between Welling's Alley and Spruce St., two-st'y brick building, 26′ 7″ x 181′ 3″; Coffrode & Saylor, contractors.

Belgrade St., between Norris and Capwell Sts., two-st'y dwell., 17′ x 42′; Jno. S. Baldt & Son, contractors.

Pine St., between Sixtieth and Sixty-first Sts., three-st'y dwell., 20′ x 25′; Wm. Douglass, contractor.

Unity St., between Paul and Main Sts., three-st'y dwell., 16′ x 42′; Amos H. Taylor, owner.

Cambria St., s w cor. Leithgow St., 5 two-st'y dwells., 14′ x 36′; John J. McDuffy, owner.

Frankford Road, between York and Adams St., ice-house, 33′ x 66′; Weisbrod & Hess, owners.

Manayunk Ave., s e cor. Woodvale Ave., 2 two-st'y dwells., 16′ x 32′; Chas. E. Bartle, owner.

McClellan St., e s, between Eleventh and Twelfth Sts., three-st'y dwell., 16′ x 28′; Chas. McCartney, owner.

Philadelphia St., between Fifteenth and Sixteenth Sts., two-st'y stable, 16′ x 50′; Jno. Holton, contractor.

Adams St., cor. Hermit St., three-st'y dwell., 18′ x 32′; Cunningham & McIlvaine, contractors.

Fisher's Lane, cor. Wakefield St., two-st'y stable, 16′ x 24′; I. Springthorpe, owner.

St. Louis.

BUILDING PERMITS. — Sixty-four permits have been issued since our last report, thirty-two of which are for unimportant frame houses. Of the rest, those worth $2,500 and over are as follows:—

Skillings, Schneider & Co., three-st'y brewery; cost, $4,300; E. Jungenfeld, architect; Boehler & Webber, contractor.

Greentree Brewery Co., two-st'y addition to brewery; cost, $4,800; E. Jungenfeld, architect; contract sub-let.

Anheuser Bush Brewing Co., one-st'y storage-house; cost, $3,000; E. Jungenfeld, architect; contract sub-let.

New Advertisements.

D. APPLETON & CO. (New York), Books. Page 4, Supplement.
NEW YORK DRAWING OFFICE (New York, N.Y.), Details and Designs. Page iv.
WARREN EHRET ROOFING CO. (Philadelphia), Roofing Materials. Page xi.

BUILDING INTELLIGENCE.

Mr. Richter, two-st'y dwell.; cost, $5,000; E. T. Hoffmann, architect and contractor.

Mrs. Lambert, double two-st'y tenement; cost, $2,600; J. Weis, contractor.

Chas. B. Greely, two-st'y dwell.; cost, $2,500; Dan Evans, contractor.

Th. Toolan, double dwell.; cost, $5,600; G. B. Legg, architect; J. D. Wharton, contractor.

A. R. Franke, two-st'y tenement; cost, $4,000; J. B. Legg, architect; R. S. Park, contractor.

P. Wittenberg, 2 adjacent two-st'y dwells.; cost, $4,800; Kirchner & Bro., architects; A. Whri, contractor.

J. M. Gaik, four-st'y stores and dwells.; cost, $8,000; S. Hoffmann, contractor.

Mrs. C. Schlag, 9 adjacent two-st'y stores and tenements; cost, $16,000; Klute & Hildebrandt, contractors.

D. Sarott, two-st'y brick dwell.; cost, $2,600; Zimmerman & Linnen, contractors.

E. W. Donk, two-st'y brick dwell.; cost, $7,100; E. C. Janssen, architect; C. Linnenkohl, contractor.

Johan C. Felber, two-st'y brick tenement; cost, $2,500; Jos. Shuster, contractor.

General Notes.

ATLANTA, GA.—The Legislature of Georgia has voted to go on with the construction of the State Capitol under the present contract with Mr. Horne, of Ohio, and not to discriminate in favor of State quarries.

BAY CITY, MICH. — P. C. Flocter & Co., have just let a contract for erecting and completing a new church for Trinity parish here; to be Gothic, built of Sandusky limestone, trimmed with Berea sandstone, and to cost when completed $40,000.

EAST HARTFORD, CONN. — H. G. Beaumont has commenced a new house on Wells Ave.

Joel C. Taff is going to build on Woodbridge Ave. a double tenement-house immediately.

FALL RIVER, MASS. — The corner-stone of the new Episcopal Church of St. James, was laid Saturday, November 22.

LYNN, MASS. — Marshal H. Abbott is to build 15 new houses.

ST. PAUL, MINN. — August Riesner, two-st'y frame store and dwell., s s of West Seventh St., bet. Lee Ave. and Seventh St.; cost, $3,000.

William Faulke, two-st'y frame dwell., 27′ x 43′, s s of Lincoln Ave., bet. Oakland and Dale Sts.; cost, $3,500.

WASHINGTON, D. C. — Senator Edmunds of Vermont, has purchased the lot on the n s of Pennsylvania Ave. and cor. of Twenty-first St., where he will build a house.

COMPETITION.

AMERICAN ARCHITECT COMPETITIONS.—NEW SERIES.

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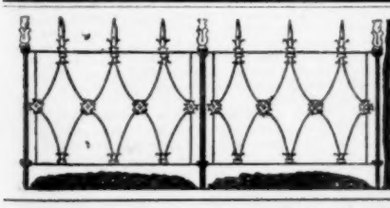

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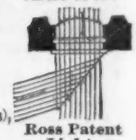

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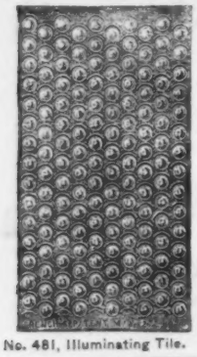

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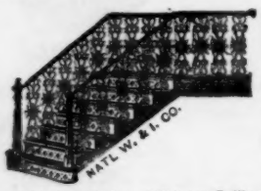

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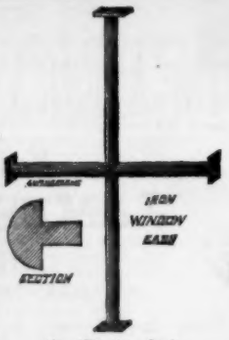

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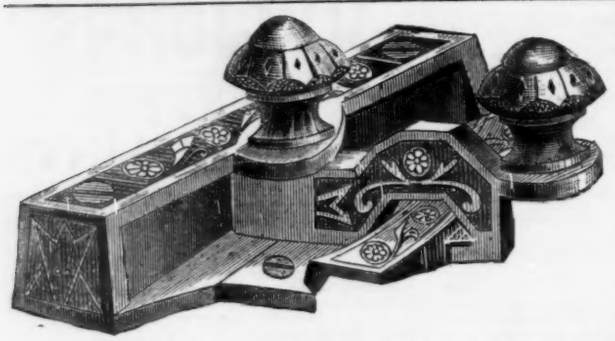

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10	.75	40	2.00	75	"	7.00	Trade discount, 33⅓%.		

COMPETITION.

PROGRAMME.

Most people who live in the country, or in the suburbs of a large town, and have sufficient means, usually feel obliged to "set up their carriage," and of course a carriage implies horses, and a building in which the entire establishment can be housed. Therefore we propose as the subject of the present competition a barn such as the dweller in a house that has cost $5,000 would consider an appropriate adjunct of his establishment; but as this may be somewhat ambiguous, seeing that some men think more of their horses than they do of their families, we will say that the proprieties would be best observed if the cost of the barn should range between $1,000 and $1,500.

The barn must furnish accommodation for two horses and a cow; the carriage-room must be large enough for two wheeled vehicles and a sleigh; and proper provision must be made for harness, feed and hay, and the stableman must not be overlooked. Water and ventilation must also be kept in mind.

Required:—A perspective drawing of the barn, elevations of the sides not shown in the perspective, a plan or plans, and a reasonable amount of detail; all to be included on a single sheet, 21″ x 33″ within the framing lines. A short description and the result of a *bona fide* estimate must also be furnished. For the best three designs we will pay equal prizes of thirty dollars each.

Conditions:— Drawings must be received at the office of the *American Architect*, on or before Saturday, December 20, 1884.

The three prize drawings are to remain the property of the publishers.

All designs submitted are subject to publication in the *American Architect* at the pleasure of the editors.

All designs must be sent in signed only by a motto —*not a graphic symbol*—the name and address of the author being sent enclosed in a sealed envelope, endorsed with a duplicate motto.

The jury of award will be composed of three architects.

PROPOSALS.

HARDWARE. [At Memphis, Tenn.]

Office of Supervising Architect, Treasury Department, Washington, D. C., November 28, 1884.

Sealed proposals will be received at this office **until 2 o'clock, P. M., on the 12d of December, 1884,** for supplying and delivering at the United States Treasury Building at Washington, D. C., all the hardware required for the custom-house and post-office building at Memphis, Tenn., in accordance with specification and schedule, copies of which and any additional information may be had on application at this office, or the office of the superintendent.

Bids must be accompanied by a certified check, and those received after the time of opening will not be considered.

M. E. BELL,
468 Supervising Architect.

LABOR AND MATERIALS, FOR MARINE HOSPITAL BUILDINGS. [At Baltimore, Md.]

Office of Supervising Architect, Treasury Department, Washington, D. C., November 29, 1884.

Sealed proposals will be received at this office, **until 2 P. M., on the 20th day of December, 1884,** for all the labor and materials required in the erection of the marine hospital buildings at Baltimore, Md., in accordance with drawings and specification, copies of which and any additional information may be obtained on application at this office, or the office of the Superintendent.

Bids must be accompanied by a certified check, and those received after the time of opening will not be considered.

M. E. BELL,
468 Supervising Architect.

IRON LIGHT-HOUSE. [At Croatan Sound, N. C.]

Office of the Light-House Engineer, Fifth and Sixth Districts, Baltimore, Md., November, 1884.

Sealed proposals will be received at this office **until 12 o'clock, M., of Saturday, the 13th day of December, 1884,** for furnishing the materials and labor of all kinds necessary for the completion of the metal-work of the Croatan Light-House, Croatan Sound, N. C.

Plans, specifications, forms of proposal and other information may be obtained on application to this office.

The right is reserved to reject any or all bids, and to waive any defects.

JARED A. SMITH,
Major of Engineers, U. S. A.,
467 Light-House Engineer, 5th and 6th Districts.

POST-OFFICE LETTER BOXES. [At Ottawa, Canada.]

Department of Public Works, Ottawa, November 17, 1884.

Sealed tenders addressed to the undersigned, and endorsed "Tender for Post-Office Letter Box Fronts," will be received **until Monday, 15th,** proximo, inclusive for the supply of about 10,000 post-office letter box fronts.

Parties disposed to submit tenders may obtain forms of tender, specification, and any further particulars at this department.

Parties tendering will be required to submit with their tenders a sample of the box they are prepared to provide.

Tenders will not be considered unless made on the printed form supplied, and signed with the actual signatures of the parties tendering.

The department will not be bound to accept the lowest or any tender.

By order, F. H. ENNIS,
468 Secretary.

ELEVATOR. [At Hamilton, Ont.]

Department of Public Works, Ottawa, November 18, 1884.

Sealed tenders addressed to the undersigned, and endorsed "Tender for Hydraulic Elevator, New Public Building, Hamilton," will be received at this office **until Saturday, the 13th day of December next,** inclusive, for the placing of a hydraulic passenger and freight elevator in the above building.

General conditions, form of tender, and all necessary information can be obtained at this department on and after Monday, the 22d instant.

Tenders must be made on the printed forms supplied.

Each tender must be accompanied by an *accepted* bank cheque, made payable to the order of the Honorable the Minister of Public Works, *equal to five per cent* of the amount of the tender, which will be forfeited if the party decline to enter into a contract when called on to do so, or if he fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The department will not be bound to accept the lowest or any tender.

By order, F. H. ENNIS.
467 Secretary.

CATHEDRAL. [At Kingston, Ont.]

Sealed tenders will be received **up to noon on Saturday, the 20th December,** for the completion of St. Mary's Cathedral, Kingston, Ont., which comprises principally the building of the main tower and spire in stone from the ground line to the height of 292 feet. Also the completion of four stone turrets to the height of 112 feet, and two turrets to the height of 160 feet. Plans and specifications to be seen at the Bishop's Palace, Kingston, Ont., and at the office of the undersigned, 235 Wilbrod St., Ottawa, after the 25th inst., where printed forms of tender and all necessary information can be obtained.

Tenders to be addressed to the Chairman of Improvement Committee Kingston Cathedral.

The lowest or any tender not necessarily accepted.

468 JAMES R. BOWES, Architect.

JETTY. [At Christiana River, Del.]

U. S. Engineer Office, 606½ Market St., Wilmington, Del., November 11, 1884.

Sealed proposals, in triplicate, will be received at this office **until 12 o'clock, noon, of December 10, 1884,** for furnishing the materials and work required for building an additional height of four feet of crib work on the jetty now standing at the Christiana River, Del., also for the sheet piling and stone filling required.

Specifications, etc., and all desired information can be had on application to WM. F. SMITH,
467 United States Agent.

BRIDGES. [In Nebraska.]

Department of the Interior, Office of Indian Affairs, Nov. 17, 1884.

Sealed proposals, endorsed "Proposals for Building Bridges," will be received at this office **until 1 o'clock, Tuesday, the 16th day of December, 1884,** for the construction of three bridges on the Santee Sioux Reservation in Nebraska and Ponca Reservation in Dakota, at the following locations: on the Santee Reservation over the Bazile Creek, a bridge of three spans of sixty feet each, with fifteen feet approaches; on the Ponca Reservation, over the Niobrara River, a bridge nine hundred and sixty feet from end to end, and over the west fork of said river a span of sixty feet.

The bridges in question are to be of combination of wood and iron, with cast-iron shoes, resting on pile foundations, which over the Niobrara River are to be driven fifteen feet, over Bazile Creek thirteen feet, and over west fork of Niobrara River, fifteen feet, below water-level, and are to be built in accordance with plans and specifications to be seen at the offices of the Depot Quartermaster, at Omaha, Neb., the *Times*, of Denver, Col., and of the *Inter-Ocean*, of Chicago, Ill.

The construction of the bridges to be under the immediate supervision of a person to be designated by this department.

All bids must be accompanied by a certified check on some United States Depository, for at least five per centum of the amount of the proposal, which check will be forfeited to the United States in case any bidder or bidders fail to execute a contract with good and sufficient sureties; otherwise to be returned to the bidder.

In submitting bids, bidders should state the time required by them for the construction of the bridges, as this matter will be considered in making the awards, and made a part of the contract.

The right is reserved to reject any or all bids, or any part of any bid, if deemed for the best interest of the service.

H. PRICE, Commissioner.
468

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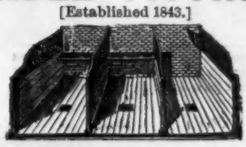

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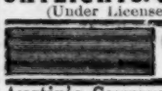

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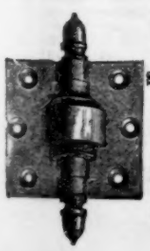

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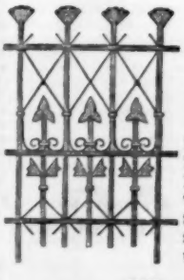

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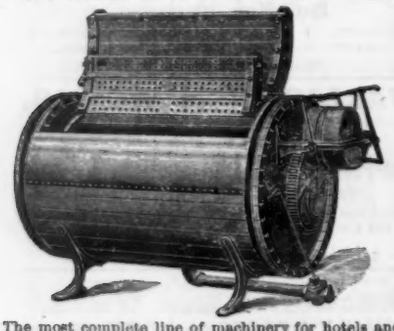

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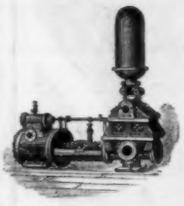

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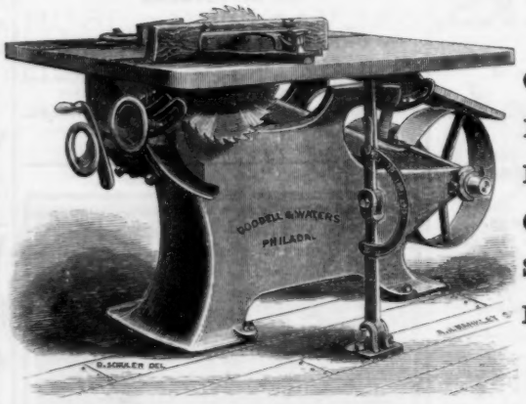

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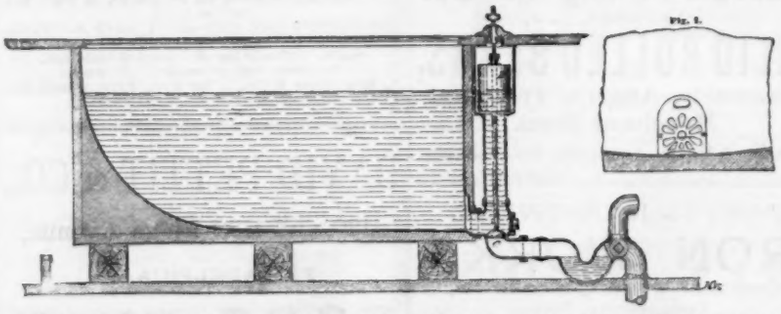

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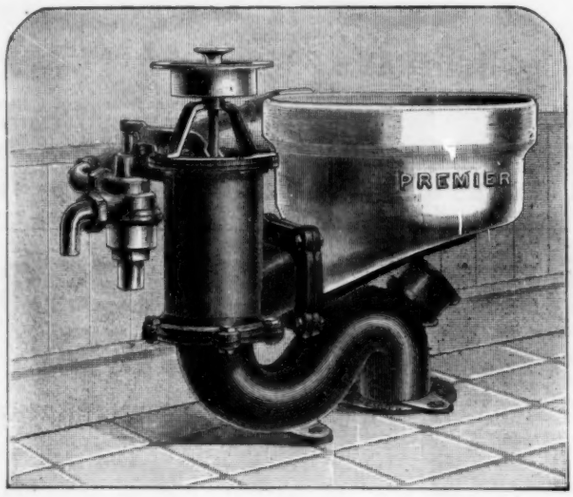

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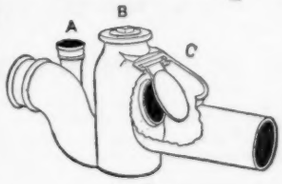

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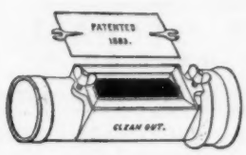

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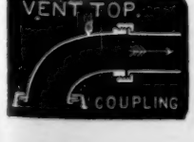

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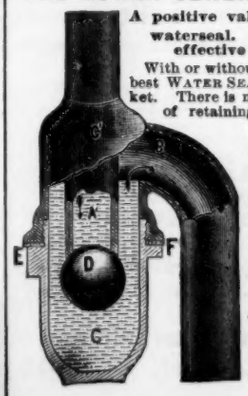

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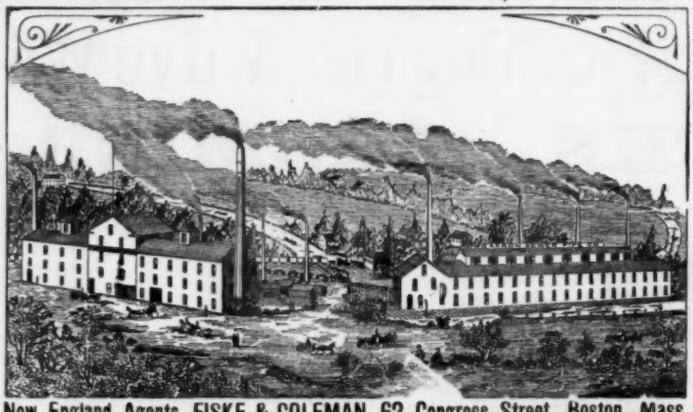

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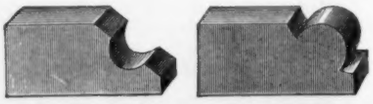

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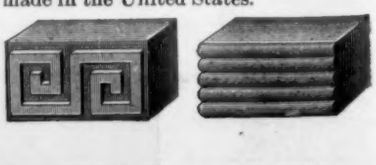

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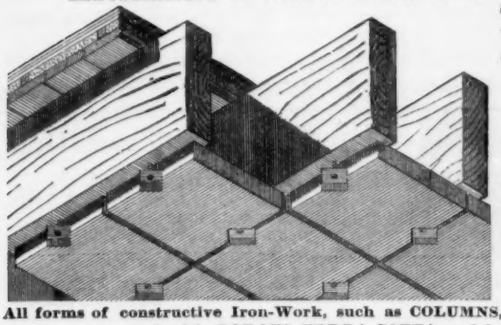

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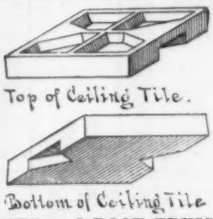

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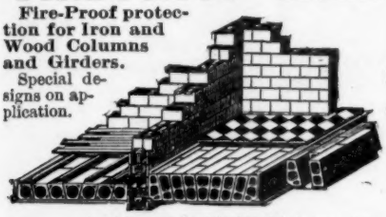

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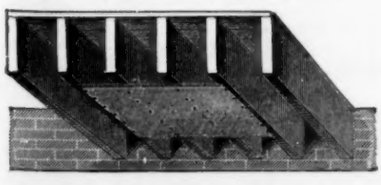

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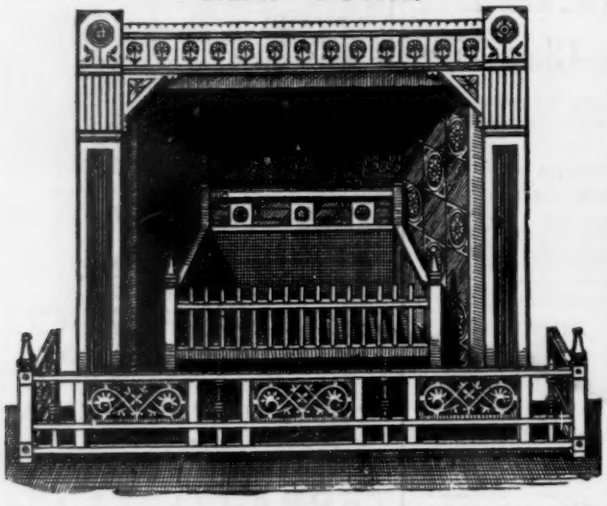

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